REGISTRATIONS OF CULTIVARS

Registration of 'Idlib-3' Lentil

'Idlib-3' lentil (*Lens culinaris* Medik.) (Reg. no. CV-20, PI 634542) was developed at the International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria, and released in 2002 by the General Commission for Scientific Agricultural Research (GCSAR), Ministry of Agriculture and Agrarian Reform, Syria. It is a high-yielding, red-cotyledon lentil cultivar with lodging resistance and resistance to lentil vascular wilt disease [caused by *Fusarium oxysporum* f. sp. *lentis* (Vasudeva & Srinavasan) Gordon.]. The cultivar is tolerant to drought, which is mainly achieved through its rapid grain filling capacity and early maturity and has been recommended for cultivation in low rainfall (<350 mm) areas in Syria.

The Food Legume Improvement Program of GCSAR, Syria, received the line ILL 6994 from ICARDA in 1990. It is a breeding line developed at ICARDA from a cross between ILL 99 and ILL 5588 commissioned in 1983. The female parent, ILL 99, is a Moroccan landrace, and the male parent, ILL 5588, is an elite line developed through pure line selection from a Jordanian landrace population. The line was developed following a bulk-pedigree method and included in the international testing program as FLIP 90-25L. The line was later designated as ILL 6994 in the ICARDA's Lentil Germplasm Catalog and released for commercial production with its popular name Idlib-3.

Idlib-3 was identified as a promising line from Lentil International Yield Trial (small seed) in the 1990–1991 cropping season. After seed increase in the 1991–1992 season, it was evaluated over the 3-yr period at six research stations of GCSAR (representing lentil-growing environments in Syria) under the national yield testing program from 1992–1993 to 1994–1995. It produced an average yield of 1010 kg ha^{-1} compared with 893 kg ha^{-1} for check, 'Hurani' (ILL 2130), an increase of 13.1%. Results of on-farm trials from 1995–1996 to 1997–1998 across 14 locations (six research stations and eight farmers' fields) revealed that Idlib-3 gave a mean yield of 1296 kg ha^{-1} compared with 1123 kg ha ha^{-1} for Hurani, an increase of 15.4%. Under large-scale production in farmers' fields, Idlib-3 out-yielded the check by 47.1%. Comparing zone-wise yielding ability, Idlib-3 gave an average yield increase of 29.9% in zone B (rainfall, 250-350 mm) and 8.2% in zone A (rainfall, >350 mm) over the local check, Hurani. Lentil straw is a valuable animal feed in Syria, and the variety produced an average straw yield of 3716 kg ha^{-1}.

Lentil Fusarium wilt disease is the major impediment of lentil production in the region. Yield losses up to 72% have been reported in Syria (Bayaa et al., 1986). Idlib-3 is a wilt resistant cultivar as evidenced from its performance in plastic house evaluations and under field-testing. In a wilt-sick plot at Tel Hadya, Idlib-3 showed a high level resistant reaction with only up to 5% wilted or dead plants compared with up to 70% wilted plants for the local check, Hurani. Under on-farm testing over years and across locations, the highest incidence of wilt for Idlib-3 was 3.8%.

Manual harvesting is a major constraint for lentil cultivation in Syria. It has been estimated that about 47% of the total cost of production is required for harvest by manual labor (ICARDA, 1999). Farmers' cultivars and landraces are semi-spreading types, susceptible to lodging and not suitable for mechanical harvest. Idlib-3 plants have an erect growth habit and strong stems with upright branching and, thus providing lodging resistance and are suitable for mechanical harvesting. It forms its lowest pod at about 15 cm above soil level, which reduces harvest losses. Plants of Idlib-3 are medium-statured (37 cm tall), another advantage for mechanical harvesting. Its leaves and stems are pubescent and devoid of pigmentation. Flowers are white with an average of three flowers per peduncle. Leaflet size is 2.1 cm^2 and leaves have short tendrils (1.5 cm). It bears an average of 35 pods per plant, with an average of 1.3 seeds per pod. Its seed weight is 3.02 g 100^{-1} seed, compared with 2.07 g for Hurani. Ground color of testa is brown with patterns in black spots and the cotyledons are bright orange. Idlib-3 flowers 121 d after planting and matures in 153 d. Protein concentration for dehulled seeds of Idlib-3 is 25.7% and the straw has 6.8% protein. Seeds take 33 min to cook.

Seeds of Idlib-3 are maintained by the Germplasm Program of ICARDA at Aleppo, Syria, and are available in small quantities on written request. Plant variety protection will not be sought for Idlib-3.

F. El-Ashkar, A. Sarker,* W. Erskine, B. Bayaa,
H. El-Hassan, N. Kadah, and B.A. Karim

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Registration of 'Idlib-4' Lentil

'Idlib-4' lentil (*Lens culinaris* Medikus spp. *culinaris*) (Reg. no. CV-21, PI 634543) was developed at the International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria, and released in 2002 by the General Commission for Scientific Agricultural Research (GCSAR), Ministry of Agriculture and Agrarian Reform, Syria. It is a high yielding, red cotyledon lentil cultivar with lodging resistance and has a high level of resistance to lentil Fusarium wilt disease [caused by *Fusarium oxysporum* f. sp. *lentis* (Vasudeva & Srinavasan) Gordon.]. Idlib-4 has been recommended for commercial cultivation throughout zone A (rainfall > 350 mm) in Syria.

Idlib-4 was developed from the cross ILL 5879 × ILL 5714 made at ICARDA in 1985. The female parent, ILL 5879, is an elite breeding line developed at ICARDA from a cross between ILL 39 (Syria) and ILL 479 (Lebanon). The male parent, ILL 5714, was derived from a cross, ILL 500 (Mexico) × ILL 1719 (Ethiopia). The line was developed following a bulk-pedigree method. It was entered into the international testing program as FLIP 92-36L in 1992, and later was designated as ILL 7201 in ICARDA's Lentil Germplasm Catalog.

Idlib-4 was initially identified by the Syrian national program as a promising line in the 1992–1993 cropping season from the Lentil International Yield Trial. Subsequently it was evaluated over the 3-yr period at six research stations of GCSAR from 1993–1994 to 1995–1996. Across the six locations, Idlib 4 produced an average yield of 1082 kg ha^{-1} compared with 893 kg ha^{-1} for the local check, 'Hurani' (ILL 2130), an increase of 21%. In on-farm trials from 1996–1997 to 1998–1999 across 14 locations (six research stations and eight farmers' fields), Idlib-4 produced a mean yield of 1346 kg ha^{-1} compared with 1123 kg ha^{-1} for Hurani, an increase of 20%. Under village project scheme, in large-scale production in farmers' fields, Idlib-4 out-yielded the check by 22%. In zone-wise performance, it gave an average yield increase of 18% in zone A (rainfall $>$ 350 mm) and 25% in zone B (rainfall 250–350 mm) over the local check, Hurani.

Lentil straw is highly demanded in Syria for animal feed, and the Idlib-4 produces an average straw yield of 4.0 Mg ha^{-1} compared with 4.1 Mg ha^{-1} for Hurani.

Lentil Fusarium wilt disease is the major impediment of lentil production in the region. Yield losses up to 72% have been reported in Syria (Bayaa et al., 1986). Idlib-4 is a wilt resistant cultivar as evidenced from its reaction in plastic house evaluations and field-testing. In wilt screening studies at Tel Hadya, disease severity for Idlib-4 was less than 5% compared with up to 70% wilted or killed plants in Hurani. Under on-farm testing over years and across locations, the highest disease severity recorded in large plots was 5.7% wilted or killed plants.

The major constraint of lentil cultivation in Syria is the high harvest cost by manual labor (ICARDA, 1999). Traditional cultivars are susceptible to lodging and not suitable for mechanical harvest. Idlib-4 plants have better lignified strong stems and branches with erect growth habit, thus providing lodging resistance and are suitable for mechanical harvesting. Its average plant height is 36 cm, lowest pods form at about 15 cm above soil level, which reduces harvest losses. Leaves and stems of Idlib-4 are pubescent but nonpigmented. Flowers are white with an average of 2.5 flowers per peduncle. Leaflet size is 2.1 cm^2 and leaves have medium-long tendrils (2.5 cm). Plants bear an average of 28 pods with an average of 1.4 seeds per pod. Seed weight is 3.04 g 100^{-1} seeds compared with 2.07 g for Hurani. Testa color of Idlib-4 is gray without pattern and the cotyledons are bright orange. The cultivar flowers after 121 d and matures after 153 d. The protein concentration for dehulled seeds of Idlib-4 is 26.2% and the straw has 7.9% protein. Approximate cooking time for Idlib-4 seeds is 34 min.

Seeds of Idlib-4 are maintained at the Germplasm Program of ICARDA at Aleppo, Syria, and are available in small quantities on written request. Plant variety protection will not be sought for Idlib-4.

F. El-Ashkar, A. Sarker,* W. Erskine, B. Bayaa, H. El-Hassan, N. Kadah, and B.A. Karim

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Registration of 'FMC-6' Bermudagrass

'FMC-6' bermudagrass [*Cynodon dactylon* (L) Pers.] (Reg. no. CV-45, PI 584451) is a seed-propagated, turf-type cultivar released in 1995 by Pennington Seed/Seeds West. FMC-6 was tested under the experimental designations FMC-K and FMC 6-91.

FMC-6 is an open-pollinated cultivar with the original polycross consisting of 14 parent clones selected for shorter internode length, dark-green color, fine leaf texture, cold tolerance, and bermudagrass stunt mite (*Eriophyes cynodoniensis* Sayed) resistance. The initial parentage traced back to the following points of origin: 43% Arizona, 21% France, 18% New Mexico, 11% Florida, and 7% unknown. The 14 clones are 16-1 (Cochise County, AZ), 17-2 (progeny of NM30), 17-3 (Unknown), 17-8 (progeny of FB-49), 17-20 (Dona Ana County, NM), 23-6 (Yuma County, AZ), 23-7 (Yuma County, AZ), 23-10 (Yuma County, AZ), 23-18 (Yuma County, AZ), 23-24 (Yuma County, AZ), 17-24 (progeny of 8 clone polycross–NM32, NM30, FB49, F29, FB133, R9P1, NM10, and NM2), K-17-3 (France), K-21 (France), and K-17-20 (France).

The original polycross consisted of seven replications and was made in 1989 at Las Cruces, NM. Seed was harvested in bulk and then subjected to three cycles of phenotypic recurrent selection. Each cycle of selection was initiated by establishing 300 individual plants from seed in Cone-tainers (Stuewe and Sons, Inc., Corvallis, OR) in a greenhouse during the winter. The plants were evaluated for approximately three months, and 100 plants that exhibited short internodes, slower vertical shoot elongation, finer leaf texture, darker green color, and absence of bermudagrass mite damage were selected. The selected plants were transplanted in the field in isolation and allowed to interpollinate. Seed was bulk harvested and used to start another cycle of selection. A Breeder seed field was established with plants from the third cycle of selection at Yuma, AZ, in 1993.

FMC-6 possesses significantly better turf quality than Arizona Common, and 'NuMex Sahara'. This is due to shorter leaf length, narrower leaf width, shorter plant height, slower vertical elongation rate, and a greater level of cold tolerance for FMC-6 than Arizona Common and NuMex Sahara (Baltensperger et al., 1998; Morris, 1997). FMC-6 possesses significantly greater turf density, darker green color, and greater bermudagrass stunt mite resistance compared to Arizona Common (Morris, 1997). FMC-6 has shown good adaptation on low pH soils (pH 3.6- 4.5) relative to other seeded bermudagrasses (Morris, 1997). FMC-6 has the potential for excellent turf performance in home lawns, parks, athletic fields, and golf courses in areas where bermudagrass is adapted.

Seed production is limited to two generations of increase beyond Breeder seed: Foundation and Certified. All classes of seed stock are maintained by Pennington Seed/Seeds West (37860 W. Smith-Enke Rd, Maricopa, AZ 85365). FMC-6 is available as Certified seed and is sold under the name Sultan$_{Brand}$ from Pennington Seed/Seeds West. U.S. Plant Variety Protection for FMC-6 has been granted (PVP Certificate No. 9500020).

C.A. Rodgers* and A.A. Baltensperger

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Registration of 'Post 90' Barley

'Post 90' barley (*Hordeum vulgare* L.) (Reg. no. CV-312, PI 549081) is a winter feed barley developed cooperatively by the Oklahoma Agricultural Experiment Station and the USDA-ARS and released in 1991. Post 90 is a composite of greenbug (*Schizaphis graminum* Rond.) resistant plant selections from the cultivar Post. Post (Edwards et al., 1985), released by the Oklahoma Agricultural Experiment Station in 1977, is a high yielding, widely adapted, winter feed barley reported to be resistant to all then known greenbug biotypes B, C, and E (Webster and Starks, 1984). Greenbug resistance is derived from a parent 'Will' (Jackson and Schelhuber, 1965), which was reported to carry the greenbug resistance gene *Grb* (Gardenhire et al., 1973) later renamed *Rsgla* (Merkle et al., 1987). Post, used extensively in greenbug biotyping studies (Puterka et al., 1988), was found heterogeneous for greenbug resistance. Post 90 is a composite of 105 Post plants that were selected for homozygous resistance to biotype C. Post 90 was assigned the experimental number OK82850 and is equivalent to Post for yield, test weight, and straw strength. It is more uniform in height, spike size, and maturity.

Post 90 is a short-strawed, six-rowed, rough-awned barley with mid- to late-season maturity. Early plant growth is semi-prostrate when fall-seeded. Spikes are short and dense with rachis internodes approximately 2 mm in length and edged with few hairs. Glumes are partially covered with long hairs and are approximately one-half the length of the lemma. Lemma awns are long and glume awns are longer than glumes. The covered kernels have a white aleurone and have a few lemma teeth on the lateral and marginal nerves. Rachilla hairs are short and hulls are slightly to semi-wrinkled. Post 90 is 2 cm shorter in stature than Post. Post 90 is adapted statewide in Oklahoma and also to some environments in the western, north western, eastern, and north eastern USA. It has been evaluated in replicated performance trials from 1983 to 1990 both in Oklahoma and in the Uniform Winter Barley Nursery at 17 locations across the barley growing areas of the USA and Canada. Average yields (22 station years) are 3961 kg ha^{-1} for Post 90 and 3972 kg ha^{-1} for Post. Test weight was 612.6 kg m^{-3} and heading date was 34 d after March 31 for both Post and Post 90. The average height of Post 90 and Post was 78 cm and 80 cm, respectively, and Post 90 exhibits good straw quality and winter hardiness. Post 90 is more homogeneous for greenbug resistance, height, spike size, and maturity than Post. A recent 4-yr study conducted at one location in Oklahoma from 1996 through 1999 showed Post 90 to be competitive in terms of yield and test weight with 10 other currently grown winter barley cultivars from across the USA. Post 90 was ranked third in grain yield and first in test weight.

Rslga in Post 90 has recently been reported to confer resistant to all currently known greenbug biotypes, B, C, E, F, G, I, J, K, CWR, and WWG (Anstead et al., 2003) except biotype H. In 1983, *Barley yellow dwarf virus* infestations were severe at four of the 17 locations of the Uniform winter Barley Nursery. Post 90 exhibited a high level of tolerance to *Barley yellow dwarf virus* with a rating of 2.5 on a scale of 0 to 9, where 0 = immune and 9 = severe infestation.

Breeders seed of Post 90 will be maintained by the Oklahoma Agric. Exp. Stn. Foundation seed will be available from the Oklahoma Foundation Seed Stocks, Inc., Plant and Soil Sciences Dep., Oklahoma State University, Stillwater, OK 74078. Seed has also been deposited in the National Seed Storage Laboratory, Ft. Collins, CO.

D.W. Mornhinweg,* L.H. Edwards,
E.L. Smith, G.H. Morgan, J.A. Webster,
D.R. Porter, and B.F. Carver

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Registration of 'Cache' Meadow Bromegrass

'Cache' meadow bromegrass (*Bromus riparius* Rehm.), (Reg. no. CV-22, PI 634710) was developed by a research team at the USDA-ARS, Forage and Range Research Laboratory at Utah State University, Logan, UT, and was released on 2 Feb. 2004 in cooperation with the Utah Agricultural Experiment Station. Cache meadow bromegrass is intended for use on irrigated and semi-irrigated pastures in the Intermountain Region and Northern Great Plains of western USA. Cache was evaluated under the experimental designation UT-MB.

The parental germplasm for Cache was derived from selections within PI 578532 ('Regar'; 20.9%) (Alderson and Sharp, 1994), PI 536012 ('Fleet'; 54.1%) (Knowles, 1990a), and PI 536013 ('Paddock'; 25%) (Knowles, 1990b). The original space-plant source nursery established in 1995 consisted of 1200 plants of meadow bromegrass representing 400 plants each of the three cultivars. On the basis of vegetative vigor in 1996, open-pollinated (OP) seed was harvested from 70 selected plants. On the basis of a selection index that included total seed yield and 100-seed weight, seed from 12 OP plants were selected and 100 seedlings from each plant were established in 1997 at the Evans Research Farm, Logan, UT, in a completely randomized design to initiate cycle-2 selection.

On the basis of vegetative vigor, OP seed from 133 cycle-2 plants were selected. With additional emphasis placed on seed yield, 100-seed weight, and seedling emergence from a 7.6-cm planting depth (Maguire, 1962), this number was reduced to OP seed from 28 plants. In 1999, the 28 progeny lines

(OP cycle-2 progeny) were established at Evans Farm in an evaluation nursery and a separate 28-clone crossing block. On the basis of increased seasonal growth under repeated defoliation and drought tolerance, 21 clones were selected in 2000 and allowed to polycross. Seed from each plant was evenly bulked to form Breeder seed in 2000. Breeder seed was additionally produced in 2001, 2002, and 2003.

Meadow bromegrass is a perennial grass of Eurasian origin (Tzvelev, 1976). It is less rhizomatous than smooth bromegrass, with leaves and stems that are pubescent. Morphologically, Cache is significantly taller, with longer flag leaves that are oriented higher on the culm than Fleet. In addition, Cache has a longer first glume and lemma than Fleet and Regar and fewer florets per spikelet than Regar, but more florets per spikelet than Fleet. Cache meadow bromegrass has a chromosome number of $2n = 10x = 70$, which is the same as Regar, Fleet, and Paddock (Tuna et al., 2001). Cluster analysis (Rohlf, 2000) based on amplified fragment length polymorphisms (Vos et al., 1995) distinguished eight of 11 Cache genotypes. Analysis of molecular variance (AMOVA) demonstrated significantly more DNA polymorphisms among cultivars relative to DNA variation within cultivars (Excoffier et al., 1992). Cache genotypes displayed significantly more genetic diversity than Fleet, less diversity than Regar, and diversity similar to Montana (Cash et al., 2002), MacBeth, and Paddock (Leonard et al., 1999).

Under a line-source study, with irrigation rates that ranged from 10.1 to 36.8 mm per week, Cache meadow bromegrass produced significantly more dry matter than Fleet at all irrigation rates and significantly more dry matter than Regar at the two lowest irrigation rates. Distribution of available forage throughout the growing season was similar to Fleet and Regar. Under repeated defoliation (six-harvests per year) Cache yielded significantly more total dry matter than orchardgrass (*Dactylis glomerata* L.) cultivars Ambassador and Latar on an irrigated site in northern Utah.

Cache meadow bromegrass was evaluated in the Northern Plains Regional Trials at Bluecreek, UT; Green Canyon, UT; Mead, NE; Sidney, NE; Mandan, ND; and Miles City, MT for dry matter forage production and percent stand. When combined over six locations and three years, Cache produced significantly more dry matter forage than Regar and Fleet, ‘Paiute’ orchardgrass, and ‘Manchar’ smooth bromegrass (*B. inermis* L.). Cache produced (not always significant) more dry matter forage than Regar and Fleet in all locations except for Sidney. Across locations, Cache meadow bromegrass was similar to Regar in establishment and persistence, but significantly better than Fleet, Paiute, and Manchar.

Seedling vigor of Cache meadow bromegrass, as indicated by seedling emergence from a deep planting depth (7.6 cm), was better than Regar and comparable to Fleet and Paddock. Individual seed weight of Cache was comparable to Fleet and Paddock, but significantly heavier than Regar. Cache produced 500 kg ha^{-1} seed during the second year after planting when grown in rows 0.76 m apart on an irrigated site. At 100% purity, there are approximately 190 000 seeds per kg.

Breeder, Foundation, and Certified seed classes will be recognized. Breeder seed of Cache will be maintained by the USDA-ARS Forage and Range Research Laboratory at Logan, UT. Foundation seed will be produced by the USDA-ARS at Logan and distributed to seed growers by the Utah Crop Improvement Association. Protection will be applied for under the U.S. Plant Variety Protection Act of 1970. Conditions of this license specify that seed of Cache can be marketed only as a class of Certified seed.

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Registration of ‘Choteau’ Wheat

‘Choteau’ (Reg. no. CV-955, PI 633974) is a superior yielding, wheat stem sawfly (*Cephus* cinctus Nort.) resistant hard red spring wheat (*Triticum aestivum* L.) developed by the Montana Agricultural Experiment Station and released in February 2003. Choteau is targeted for production in areas of Montana infested with the wheat stem sawfly.

Choteau was derived as an F_4 plant selection from the cross MT 9401/MT 9328. MT 9401 was a selection from the cross MT 8603/‘Amidon’ (PI 527682). MT 8603 was derived from the cross MT 7635/‘Nacozari’. MT 9328 was a selection from the cross MT 7810/MT7926. MT 7810 [‘Tezanos Pintos Precos’/‘Sonora 64’//‘Fortuna’ (PI 13596)] was a sister line to ‘Glenman’ (McNeal et al., 1985). MT 7926 was derived from a cross between an experimental line from North Dakota State University with unknown pedigree and MT 6830. MT 6830 has the pedigree ‘Sheridan’ (CI 13586)//CI 13253/5*‘Centana’ (CI 12974).

The breeding procedure for Choteau included single seed descent without selection in the F_2 and F_3 generations, followed by subsequent selection for height, maturity, stem solidness, and vigor in space-planted F_4 rows. F_5 head rows were evaluated for height, maturity, grain protein, stem solidness and apparent yield potential. Selected rows were entered into a single row replicated yield trial at Bozeman, MT, and evaluated for grain yield, grain protein, stem solidness, and dough mixing properties. Superior lines from this nursery, including Choteau, were entered into statewide yield trials following initial evaluation in preliminary yield trials in 1999.

Choteau has lax and tapering heads with white awns and glumes. Glumes are acuminate and the shoulder is wanting. Kernels are red, ovate, and have a medium brush. Kernels have a medium crease with rounded cheeks. Anthocyanin is absent in the coleoptile and the flag leaf is erect. Mature plant color is white.

Choteau has solid stems, which confers resistance to the wheat stem sawfly. On a scale of 5 through 25, where 5 is hollow and 25 is solid, Choteau had an average stem solidness score over six locations of 21.5 versus 16.8 and 13.6 for Fortuna and 'Ernest' (PI 592761), respectively. Fortuna and Ernest are currently the most widely grown solid stemmed wheat cultivars in Montana. Data from three nurseries infested with the wheat stem sawfly have shown cutting damage to Choteau is comparable to Fortuna, and less than Ernest. Choteau is resistant to stem rust (caused by *Puccinia graminis* Pers.:Pers.) based on artificial inoculation in 1998 through 2002 with a bulk of uredospores initially collected from eastern Montana from 1990 through 1996. Race composition of the bulk is unknown. No data is available regarding reaction of Choteau to leaf rust (caused by *Puccinia triticina* Eriks.) or stripe rust (caused by *Puccinia striiformis* Westend.). Choteau is susceptible to the Russian wheat aphid [*Diuraphis noxia* (Mordvilko)].

Choteau was originally evaluated in a preliminary yield nursery at four Montana locations in 1999, and has been tested yearly at nine or ten Montana locations since 2000. Choteau was entered in the Uniform Regional Hard Red Spring Wheat Nursery in 2001 and 2002 under the experimental number MT 9929. Mean grain yield of Choteau over 28 location/years was 4414 kg ha^{-1} compared with 4450 kg ha^{-1} for 'McNeal' and 3732 kg ha^{-1} for Fortuna. McNeal (PI 574642) (Lanning et al., 1995) is a hollow-stemmed wheat cultivar and has been the most widely grown cultivar in Montana since 1996. Mean grain volume of Choteau was 775 kg m^{-3} as compared with 768 and 773 kg m^{-3} for McNeal and Fortuna, respectively. Mean heading date was June 23 for Choteau, June 26 for McNeal, and June 24 for Fortuna. Height of Choteau averaged 68.4 cm, while McNeal and Fortuna averaged 73.2 and 84 cm, respectively. Choteau is resistant to lodging. Observations of segregation patterns indicate that Choteau has the Rht2 gene for semi-dwarf habit.

Grain protein of Choteau over 28 location/years averaged 156 g kg^{-1}. Grain protein of McNeal and Fortuna were 151 and 153 g kg^{-1}, respectively. Flour yield for Choteau averaged 649 g kg^{-1}, compared with 644 and 679 g kg^{-1} for McNeal and Fortuna, respectively. Water absorption was 742, 759, and 729 g kg^{-1} for Choteau, McNeal and Fortuna, respectively. Loaf volume for Choteau averaged 1130 cm^3, compared with 1191 and 1095 cm^3 for McNeal and Fortuna, respectively.

Breeder seed was developed by selection for solid stems and uniformity among 400 head rows. Approximately 320 selected head rows were subsequently grown as six row plots at Bozeman, and aberrant plots were discarded. Remaining plots were bulked to form Breeder seed for Choteau. Breeder, Foundation, Registered and Certified classes of seed are recognized. Breeder and Foundation seed will be maintained by the Department of Plant Sciences and Plant Pathology, Montana Agricultural Experiment Station, Bozeman, MT 59717. Small quantities of seed are available by request from the corresponding author.

S.P. Lanning, G.R. Carlson, D. Nash, D.M. Wichman, K.D. Kephart, R.N. Stougaard, G.D. Kushnak, J.L. Eckhoff, W.E. Grey, and L.E. Talbert*

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Registration of 'Nu Destiny' Kentucky Bluegrass

'Nu Destiny' Kentucky bluegrass (*Poa pratensis* L.) (Reg. no. CV-81, PI 632270) is a turf-type cultivar released in August 2002 by J.R. Simplot Co., Jacklin Seed, Post Falls, ID. Experimental designations for Nu Destiny were 94-2695 and J-2695.

Nu Destiny originated as an apomictic single-plant selection from the progeny of hybrid 92-4275, created in the field at Post Falls in June 1992, using plant 90-0416 as the maternal parent and 'Midnight' (Meyer et al., 1984) as the pollen parent. Breeding line 90-0416 is a dark green, apomictic plant selected 10 July 1990 as a progeny from an open-pollinated hybridization of 'Huntsville' (Jacklin et al., 1989). The color of 90-0416 is similar to 'Glade' (Jacklin et al., 1977), the probable pollen parent. Seeds harvested from 90-0416 plants were sown in greenhouse flats during the spring of 1993, and later transferred to a spaced-plant nursery of 40 701 plants. Offspring with characteristics dissimilar to 90-0416 were selected during maturation in 1994. Plant 94-2695 was identified as being unique from 90-0416 by its vegetative turf characteristics before heading. It produced 14 g of seed per plant, which is typical for a bluegrass spaced plant in northern Idaho.

Seed harvested from 94-2695 was tested in turf quality trials in Idaho in 1994 (at 13- and 31-mm mowing heights), in Maryland in 1995 (at 9.5- and 50-mm mowing heights), New Jersey in 1997, and Ohio in 1999. Seed yielding ability was evaluated in trials in Idaho and Washington in 1998. First Breeder seed was produced in 1999 and first Certified seed in 2001, although none was released until 2002.

Panicles of Nu Destiny are primarily of the drooping type, with the top half of the panicle noticeably drooping. Panicle coloration at anthesis is light olive green, with only a slight pinkish cast to the tips. Seed production fields at anthesis appear to be slightly less purple than other cultivars, such as Midnight. Leaf texture in seed production fields is very fine, with most leaves remaining low in the flowering canopy.

Progeny apomixis trials were conducted in a spaced-plant nursery established near Post Falls in May 1998. Among 747 Nu Destiny plants, 3.4% were variants in the vegetative (preheading) stage, 2.4% were heading maturity variants, 3.2% miniature plants, and 0.8% plants produced no inflorescences. As spaced plants, Nu Destiny averaged 90% apomictic; however, in commercial seed production, apomixis varied from 85 to 95%, depending on weather and year. Most variants of Nu Destiny are shorter growing than the majority plant form. Approximately 25% of variants are slightly taller than the majority. Most variants have lower seed yielding potential. Aberrant plants are removed from seedstock fields but will continue to be expressed in each generation due to the facultative apomictic nature of Kentucky bluegrass.

Nu Destiny was tested in the 2000 National Turfgrass Evaluation Program (NTEP) trials for Kentucky bluegrass (Morris, 2002, 2003). In the trial, Nu Destiny had a dark green genetic color; good resistance to close mowing (25 mm or lower), traffic stress, and shade; and it produced few seed stalks in mowed turf. It ranked fourth among 173 entries nationwide in overall turf quality in 2001 and did particularly well in the Northeastern, Transition Zone, and Midwestern states, where it was the top-ranking entry. Nu Destiny exhibited good resistance to leafspot [caused by *Drechslera poae* (Baudys) Shoem] and showed good resistance to leaf rust (caused by *Puccinia coronata* Corda var. *coronata*), dollar spot (caused by *Lanzia* Sacc. or *Moellerodiscus* Henn.), and anthracnose [caused by *Colletotrichum graminicola* (Ces.) G.W. Wils. (teleomorph: *Glomerella graminicola* Politis)]. In 4 yr of commercial seed production, Nu Destiny has demonstrated the potential for high yields of quality seed, relative freedom from ergot [caused by *Claviceps purpurea* (Fr.) Tul.], and no adverse reactions to labeled Kentucky bluegrass pesticides.

Nu Destiny is recommended for golf course tees, fairways, and roughs, and for lawns, parks, and sports turf, in full sun or some shade, in areas where Kentucky bluegrass is well adapted for turf. It is compatible in blends and mixtures with other cool-season turfgrasses at mowing heights as low as 13 mm.

Breeder seed is maintained by J.R. Simplot Co., Jacklin Seed, with seed increase limited to one generation each of Foundation, Registered, and Certified. U.S. Plant Variety Protection application no. 200300002 has been filed for Nu Destiny.

A.D. Brede*

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Simplot/Jacklin Seed, West 5300 Riverbend Ave., Post Falls, ID 83854-9499. Registration by CSSA. Accepted 30 April 2004. *Corresponding author (doug.brede@simplot.com).

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Registration of 'Tsunami' Kentucky Bluegrass

'Tsunami' Kentucky bluegrass (*Poa pratensis* L.) (Reg. no. CV-80, PI 631452) is a turf-type cultivar released in November 2001 by J.R. Simplot Co., Jacklin Seed, Post Falls, ID. Experimental designations for Tsunami were 94-2478 and J-2478.

Tsunami originated as an apomictic, single-plant selection from hybrid 89-1032, created in the field at Post Falls in July 1989 using 'Limousine' (Alderson and Sharp, 1994) to pollinate plants of 'Freedom' (Jacklin et al., 1990). Seeds harvested from Freedom were sown in greenhouse flats and later transferred to a spaced-plant nursery during the spring of 1993. Progeny with characteristics dissimilar to Freedom were selected during maturation in the spring of 1994. Plant 94-2487 was differentiated from Freedom by vegetative turf characteristics before seedhead expression. It produced 29 g of seed per plant, which is above average for a typical bluegrass spaced plant in northern Idaho. Seed harvested from 94-2478 was tested in turf quality trials in Idaho in 1994, in Maryland in 1995, Ohio in 1996, and New Jersey in 1997.

Progeny apomixis trials were conducted in a spaced-plant nursery established near Post Falls in May 1997. Among 2297 Tsunami plants, 2.3% were variants in the vegetative (preheading) stage, 1% were heading maturity variants, 0.3% seedhead variants, 1.3% miniature plants, and 0.2% plants produced no inflorescences. In spaced-plant nurseries, Tsunami averaged 95% apomictic, but in commercial seed production, apomixis varied from 90 to 99%, depending on weather and year. Approximately 1% of Tsunami plants are variants with upright growth and panicles similar to Limousine. Approximately 1% of plants have distinctly earlier maturity. Most variants are shorter than the majority form and may not express themselves in row plantings. Aberrant plants are rogued from seedstock fields, but they will continue to be expressed in each generation due to the facultative apomictic nature of Kentucky bluegrass.

Tsunami was tested in the 2000 National Turfgrass Evaluation Program (NTEP) trials for Kentucky bluegrass (Morris, 2002, 2003). In the trial, Tsunami exhibited a dark green genetic color, medium-fine leaf texture, good seedling vigor, resistance to close mowing ($\leq$25 mm) and traffic stress, good shear strength/traction, and it produced few seed stalks in mowed turf. Tsunami exhibited good resistance to leafspot [caused by *Drechslera poae* (Baudys) Shoem], summer patch (caused by *Magnaporthe poae* Landschoot and Jackson), leaf rust (caused by *Puccinia coronata* Corda var. *coronata*), brown patch (caused by *Rhizoctonia solani* Kühn), and encroachment of annual bluegrass (*Poa annua* L.).

In 5 yr of commercial seed production, Tsunami has demonstrated the potential for high yields of quality seed, relative freedom from ergot [caused by *Claviceps purpurea* (Fr.) Tul.], and no adverse reactions to labeled Kentucky bluegrass pesticides.

Tsunami is recommended for golf course tees, fairways, and roughs, and for lawns, parks, and sports turf, in full sun or some shade, in areas where Kentucky bluegrass is well adapted for turf. It is compatible in blends and mixtures with other cool-season turfgrasses at mowing heights as low as 13 mm.

First Breeder seed was produced in 1999 and first Certified seed in 2001. Breeder seed is maintained by J.R. Simplot Co., Jacklin Seed, with seed increase limited to one generation each of Foundation, Registered, and Certified. U.S. Plant Variety Protection application no. 200200211 has been filed for Tsunami.

A.D. Brede*

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Registration of 'Beyond' Kentucky Bluegrass

'Beyond' Kentucky bluegrass (*Poa pratensis* L.) (Reg. no. CV-79, PI 631451) is a turf-type cultivar released in August 2001 by J.R. Simplot Co., Jacklin Seed, Post Falls, ID. Experimental designations for Beyond were 95-1880 and J-1880.

Beyond Kentucky bluegrass originated from an apomictic, single-plant selection from the open-pollinated (OP) progeny of Jacklin breeding line 93-3333. Breeding line 93-3333 was one of the selected progeny of hybrid 91-0195, created in the field at Post Falls in July 1991, using 'Limousine' (Alderson and Sharp, 1994) to pollinate plants of 'Midnight' (Meyer et al., 1984). 'Chicago II' (Brede, 2004) also originated from the 91-0195 hybridization. Breeding line 93-3333 is a very dark green, fine-textured plant with few seedheads. An apomixis rate of less than 50% makes 93-3333 a productive breeding line, with many of its hybrid progeny reverting to high levels of apomixis.

Seeds from OP 93-3333 plants were sown into greenhouse flats in 1994 and later transferred to a spaced-plant nursery. Offspring with characteristics dissimilar to 93-3333 were selected during maturation in 1995. Plant 95-1880 was identified by a different seedhead maturity than 93-3333. It produced 39 g of clean seed, which is more than double the typical seed yield for a bluegrass spaced plant in northern Idaho.

Seed harvested from 95-1880 was tested in turf quality trials in Idaho in 1995, in Ohio in 1996, New Jersey in 1999, and Maryland in 2000. Its seed-yielding ability was evaluated in a seed production block near Connell, WA, established in August 1999. The panicle color of Beyond at anthesis is predominantly light green with a characteristic whitish tone. Leaves are uniformly bluish-green and fine textured. Culms are lighter green than leaves with a noticeable brown node at the attachment of the flag leaf. Culms are smooth to the touch, and the flag leaf is slightly rough when felt basipetally.

Progeny apomixis trials were conducted in a spaced-plant nursery, established near Post Falls in May 1998. Of 1481 Beyond plants, 2.3% were variants in the vegetative (preheading) stage. In spaced-plantings, Beyond averaged 97% apomictic plants. In commercial seed production, apomixis will vary with weather, location, and year. One variant in Beyond has a lighter green leaf color, with robust plants that become noticeable before heading. Panicles of this variant appear identical to the majority in shape and color. Less than 1% of Beyond plants are a taller-growing variant with earlier maturity, broader blades, greener panicles, and a lighter leaf color. Aberrant plants are rogued from seedstock fields, but they will continue to be expressed in each generation due to the facultative apomictic nature of Kentucky bluegrass.

Beyond was tested in the 2000 National Turfgrass Evaluation Program (NTEP) trials for Kentucky bluegrass (Morris, 2002, 2003). In the trial, Beyond had a medium dark green genetic color which it retained into autumn, a medium fine leaf texture, good spring density, good sod stretching resistance, and tolerance to traffic stress, shade, and drought (wilting). Beyond exhibited good resistance to leafspot [caused by *Drechslera poae* (Baudys) Shoem] and necrotic ring spot [caused by *Ophiosphaerella korrae* (J.C. Walker & A.M. Smith) Shoemaker & Babcock] and encroachment of annual bluegrass (*Poa annua* L.).

In 5 yr of commercial seed production, Beyond has demonstrated the potential for high yields of quality seed, relative freedom from ergot [caused by *Claviceps purpurea* (Fr.) Tul.], and no adverse reactions to labeled Kentucky bluegrass pesticides.

Beyond is recommended for golf course tees, fairways, and roughs, and for lawns, parks, and sports turf, in full sun or some shade, in areas where Kentucky bluegrass is well adapted for turf. It is compatible in blends and mixtures with other cool-season turfgrasses at mowing heights as low as 13 mm.

First Breeder seed was produced in 1999 and first Certified seed in 2001. Breeder seed is maintained by J.R. Simplot Co., Jacklin Seed, with seed increase limited to one generations each of Foundation, Registered, and Certified. U.S. Plant Variety Protection application no. 200200210 has been filed for Beyond.

A.D. Brede*

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Registration of 'Chicago II' Kentucky Bluegrass

'Chicago II' Kentucky bluegrass (*Poa pratensis* L.) (Reg. no. CV-78, PI 615085) is a turf-type cultivar released in January 2000 by J.R. Simplot Co., Jacklin Seed, Post Falls, ID. Experimental designations for Chicago II were 93-2909 and J-2909.

Chicago II originated from an apomictic, single-plant selection from hybrid 91-0195, made in the field at Post Falls in July 1991 using 'Limousine' (Alderson and Sharp, 1994) to pollinate plants of 'Midnight' (Meyer et al., 1984). Seeds harvested from Midnight plants were individually sown into cells of greenhouse flats during the spring of 1992 and later transplanted to a spaced-plant nursery of 33 500 plants. Offspring with characteristics dissimilar to Midnight were selected during maturation in the spring of 1993. Plant 93-2909 differed from Midnight for turf characteristics before seedhead expression. It produced 27 g of seed, nearly twice that for a typical Kentucky bluegrass spaced plant in northern Idaho. Seed harvested from this plant was used to establish a turf trial in 1993 and a seed yield trial in 1996. No other cultivars have been released from the 91-0195 hybridization; however, 'Explorer' (Brede, 2003b), 'Arcadia' (Brede, 2003a) and 'Chicago' (Brede, 2002) were progeny of an earlier Midnight/Limousine cross.

Progeny trials were conducted in 1996 to determine the level of apomixis. A survey of 1233 plants of Chicago II showed that 6.9% of plants were variants in the vegetative (pre-flowering) stage, 0.2% were heading maturity variants, 0.1% seedhead variants, and 1% were miniature plants. Approximately half of the variants were slightly taller plants with similar seedhead appearance. Many of these variants are indistinguishable from the majority plant form in normal row-planted seed production. The mean spaced-plant apomixis rate of Chicago II was 92%, but it varied from 90% to 95% or greater, depending on growing conditions.

In seed production, Chicago II is medium-late maturing and low growing with short culm and panicle length. In seed production, Chicago II plants grow strongly via rhizomes, with lateral one-year expansion of approximately 50 cm from a single spaced plant. Chicago II is unique from many bluegrasses in its relatively late emergence from the ground in the spring in seed fields. This delayed emergence does not manifest itself in mowed turf, where the cultivar maintains an attractive winter color and greens up moderately early in the spring.

Chicago II is noteworthy for its rich, dark green genetic color in mowed turf. It was darker green than 167 of the 173 entries in the 2000 National Turfgrass Evaluation Program (NTEP) trials for Kentucky bluegrass (Morris, 2003). It has good resistance to leafspot [caused by *Drechslera poae* (Baudys) Shoem] and moderate to good levels of resistance to stem rust (caused by *Puccinia graminis* Pers.:Pers.), summer patch (caused by *Magnaporthe poae* Landschoot and Jackson), Microdochium patch {caused by *Microdochium nivale* (Fr.) Samuels and Hallett [teleomorph: *Monographella nivalis* (Schaf) E. Muller]}, and brown patch (caused by *Rhizoctonia solani* Kühn) (Morris, 2002, 2003). In 4 yr of commercial seed production, Chicago II has demonstrated the potential for high yields of quality seed, relative freedom from ergot [caused by *Claviceps purpurea* (Fr.) Tul.], and no adverse reactions to labeled Kentucky bluegrass pesticides.

Chicago II is recommended for golf course tees, fairways, and roughs, and for lawns, parks, and sports turf, in full sun or some shade, in areas where Kentucky bluegrass is well adapted for turf. It is compatible in blends and mixtures with other cool-season turfgrasses at mowing heights as low as 13 mm.

Breeder seed, first harvested in 1996, is maintained by J.R. Simplot Co., Jacklin Seed. Seed propagation is limited to one generation each of Foundation, Registered, and Certified seed. U.S. Plant Variety Protection application no. 200100042 has been filed for Chicago II.

A.D Brede*

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Registration of 'Excursion' Kentucky Bluegrass

'Excursion' Kentucky bluegrass (*Poa pratensis* L.) (Reg. no. CV-82, PI 633050) is a turf-type cultivar released in August 2002 by J.R. Simplot Co., Jacklin Seed, Post Falls, ID. The experimental designations of Excursion were J-1648 and 93-1648.

Excursion originated as an apomictic, single-plant selection from hybrid 89-1037, created in the field at Post Falls in July 1989 using 'Midnight' (Meyer et al., 1984) to pollinate plants of 'Limousine' (Alderson and Sharp, 1994). Seeds harvested from Limousine were sown into greenhouse flats and later transferred to a spaced-plant nursery of 40 701 plants in the spring of 1992. Progeny with characteristics dissimilar to Limousine were selected during maturation in the spring of 1993. Plant 93-1648 was differentiated from Limousine by vegetative turf characteristics before seedhead expression. Plant 93-1648 produced 10 g of seed, which is typical for a bluegrass spaced plant in northern Idaho. 'Freedom II' (Brede, 2004) also originated from hybrid 89-1037. A number of other high performance Kentucky bluegrass cultivars originated from Limousine/Midnight hybridization, including 'Absolute', 'Award', 'Awesome', 'Barrister', 'BlueMoon', 'Courtyard', 'Impact', 'NuGlade', 'Odyssey', 'Perfection', 'Quantum Leap', and 'Total Eclipse' (Morris, 2002, 2003).

Progeny apomixis trials were conducted in a spaced-plant nursery established near Post Falls in May 1998. Of 1057 Excursion plants, 3.5% were variants in the vegetative (preheading) stage, 0.2% were heading maturity variants, and 0.4% seedhead variants. In spaced-plant nurseries, Excursion averaged 96% apomictic plants. The predominant variant has a lighter green leaf and slightly taller culm. A small number of the variants exhibit a shorter growth habit with slightly broader leaves. Aberrant plants are rogued from seedstock fields, but they will continue to be expressed in each generation due to the facultative apomictic nature of Kentucky bluegrass.

Excursion was tested in the 2000 National Turfgrass Evaluation Program (NTEP) trials for Kentucky bluegrass (Morris, 2002, 2003). In the trial, Excursion had a dark green genetic color which it retained into winter. It had good resistance to close mowing ($\leq$25 mm), good summer density, wear tolerance, and shear strength/traction. It ranked twenty-first nationwide in overall turf quality out of 173 entries and did particularly well in the Transition Zone, Great Plains, and Midwestern states. Excursion exhibited good resistance to leafspot [caused by *Drechslera poae* (Baudys) Shoem], summer patch (caused by *Magnaporthe poae* Landschoot and Jackson), brown patch (caused by *Rhizoctonia solani* Kühn), and encroachment of annual bluegrass (*Poa annua* L.).

Excursion is recommended for golf course tees, fairways, and roughs, and for lawns, parks, and sports turf, in full sun or some shade, in areas where Kentucky bluegrass is well adapted for turf. It is compatible in blends and mixtures with other cool-season turfgrasses at mowing heights as low as 13 mm.

In 5 yr of commercial seed production, Excursion has demonstrated the potential for high yields of quality seed, relative freedom from ergot [caused by *Claviceps purpurea* (Fr.) Tul.], and no adverse reactions to labeled Kentucky bluegrass pesticides.

Breeder seed, first harvested in 1998, is maintained by J.R. Simplot Co., Jacklin Seed. Seed propagation is limited to one generation each of Foundation, Registered, and Certified. U.S. Plant Variety Protection application no. 200300210 has been filed for Excursion.

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Registration of 'Freedom II' Kentucky Bluegrass

'Freedom II' Kentucky bluegrass (*Poa pratensis* L.) (Reg. no. CV-77, PI 611131) is a turf-type cultivar released in July 1998 by J.R. Simplot Company, Jacklin Seed, Post Falls, ID. Freedom II was tested under the experimental designations 93-1539 and J-1539.

Freedom II was developed from an apomictic, single-plant selection from hybrid 89-1037, created in the field at Post Falls in July 1989 using 'Midnight' (Meyer et al., 1984) to pollinate plants of 'Limousine' (Alderson and Sharp, 1994). Progeny from the Limousine plants were grown in greenhouse flats during 1992 and later transferred to a spaced-plant nursery of 40 701 plants. Offspring with characteristics dissimilar to Limousine were selected during maturation in the spring of 1993. Plant 93-1539 was identified as a hybrid by its leaf color and texture before seedhead expression. It averaged 33 g of seed from a single spaced plant, which is approximately double the seed production of a typical bluegrass spaced plant in northern Idaho. Seed from this plant was used to establish a turf trial in August 1993, a replicated seed yield trial in 1994, and regional trials in 1994 and 1996. Mature plants of Freedom II are most similar in appearance to Limousine, but Freedom II can be differentiated from Limousine by longer panicle length ($P \leq 0.001$) and later reproductive maturity ($P \leq 0.001$). 'Excursion' (Brede, 2004) also originated from hybrid 89-1037. A number of other high performance Kentucky bluegrass cultivars originated from Limousine/Midnight hybridization, including 'Absolute', 'Award', 'Awesome', 'Barrister', 'Blue-Moon', 'Courtyard', 'Impact', 'NuGlade', 'Odyssey', 'Perfection', 'Quantum Leap', and 'Total Eclipse' (Morris, 2002; 2003).

Progeny apomixis trials were conducted in spaced-plant nurseries near Post Falls in May 1995. A survey of 1103 plants of Freedom II showed that 8.7% of plants were variants in the vegetative (pre-heading) stage, 1.2% were heading maturity variants, 0.5% were seedhead variants, and 0.9% were miniature plants. Most variants closely resemble the majority plant form; virtually no variants express a tall, common-type appearance. The mean spaced-plant apomixis rate of Freedom II is 88%, but varies from 80 to 95% or greater, depending on growing conditions. Aberrant progeny are rogued from seedstock fields to ensure continued uniformity and stability, but they will continue to occur in every generation.

Freedom II was evaluated in the National Turfgrass Evaluation Program (NTEP) trials for Kentucky bluegrass, established in 2000 (Morris, 2002, 2003). Freedom II performed particularly well in the Great Plains states, where it was similar to the top cultivar in overall turf quality during 2001. Freedom II had dark genetic color similar to Midnight, but Freedom II had improved winter color and spring greenup compared to Midnight. Freedom II had a medium-fine leaf texture, good wear resistance, and excellent resistance to sod stretching.

Freedom II has good resistance to leaf spot [caused by *Drechslera poae* (Baudys) Shoem], stem rust (caused by *Puccinia graminis* Pers.:Pers.), and anthracnose [caused by *Colletotrichum graminicola* (Ces.) G.W. Wils. (teleomorph: *Glomerella graminicola* Politis)]. In North Carolina, it showed good resistance to dollar spot (caused by *Lanzia* Sacc. or *Moellerodiscus* Henn.).

In 7 yr of commercial seed production, Freedom II has shown the potential for high yields of quality seed, with freedom from ergot [caused by *Claviceps purpurea* (Fr.) Tul.] honeydew and sclerotia. Freedom II has exhibited no adverse reactions to labeled Kentucky bluegrass pesticides.

Freedom II is recommended for lawns, golf courses, parks, and sports turf in areas where Kentucky bluegrass is well adapted for turf. It can be grown in full sun or some shade. Freedom II is compatible in blends and mixtures with other cool-season turfgrasses.

Breeder seed, first harvested in 1996, is maintained by J.R. Simplot Co., Jacklin Seed. Seed propagation is limited to one generation each of Foundation, Registered, and Certified. U.S. Plant Variety Protection application no. 9900372 has been filed for Freedom II.

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Registration of 'Pirogue' Rice

'Pirogue' (*Oryza sativa* L.) (Reg. no. CV-118, PI 634544) is the first high-yielding, early maturing, short stature, short-grain rice cultivar for the production in the southern USA. It was developed at the Rice Research Station, Crowley, LA, by the Louisiana State University Agricultural Center (LSU AgCenter) in cooperation with the USDA-ARS, the Arkansas Agricultural Experiment Station, the Mississippi Agricultural and Forestry Experiment Station, the Florida Agricultural Experiment Station, and the Texas Agricultural Experiment Station. Pirogue was officially released by LSU AgCenter in 2003.

Pirogue was developed from the cross 'Rico 1'/'S-101' made at the Rice Research Station in 1990 (90CR159). Rico 1 is a high-yielding, midseason, conventional height medium-grain cultivar released by the USDA-ARS in conjunction with the

Texas A&M University Agricultural Research and Extension Center, Beaumont, TX (Bollich et al., 1990). S-101 is a semi-dwarf, very early, short-grain rice cultivar released by the Rice Experiment Station in Biggs, CA (Johnson et al., 1989).

Pirogue originated as a bulk of F_5 seeds of panicle row 9435564 in 1994. Initially, it was tested in the preliminary yield trials (PY) in Crowley, LA, as entry PY678, in 1995. After three consecutive generations of purification and reselection in Puerto Rico and at Crowley from 1996 to 1997, it was tested again as entry PY765 in 1998 and advanced to the Cooperative Uniform Regional Rice Nurseries (URRN) in 1999 with the designation of RU9902134. The line was also evaluated in the Louisiana Commercial Advanced tests during 1999 through 2002.

The average plant height of Pirogue in 35 trials is 102 cm compared with 95 cm for Bengal and 105 for Earl. Even though Pirogue is taller than Bengal, it has a better lodging resistance than Bengal. In 37 trials, the average number of days from emergence to 50% heading for Pirogue is 83 d compared with 85 d for Bengal and 83 d for Earl.

Pirogue has an excellent grain yield and good milling yield. In 39 statewide and regional trials during 1999 through 2002, average grain yield of Pirogue was 8597 kg ha^{-1} at 120 g kg^{-1} moisture compared with 8674 and 8280 kg ha^{-1} for Bengal and Earl, respectively. In 14 state and regional tests (1999–2002), average ratoon yield for Pirogue is 1039 kg ha^{-1} at 120 g kg^{-1} moisture compared with 1773 and 1463 kg ha^{-1} for Bengal and Earl, respectively. Average milling yields (mg g^{-1} whole milled kernels: mg g^{-1} total milled rice) at 120 g kg^{-1} moisture in 27 state and regional tests from 1999 through 2002 were 610:688 for Pirogue, 630:700 for Bengal, and 591:695 for Earl.

A comparison of kernel dimensions of Pirogue with other commercial medium-grain varieties indicates that it has a short grain type (Table 1). Average apparent amylose content of Pirogue is 143 g kg^{-1} compared with 120 and 128 g kg^{-1} for Bengal and Earl, respectively. Pirogue has a low gelatinization temperature (64–68°C), as indicated by an average alkali (17 g kg^{-1} KOH) spreading value of 6. These results indicate that Pirogue has typical U.S. short-grain rice cooking characteristics as described by Webb (1991).

The flag leaf of Pirogue is shorter, wider, and less erect than that of Bengal. The plants display a fairly dark green leaf color under optimum fertilization. The leaf surface, lemma, and palea are glabrous. Some pubescence has been observed on leaf margins. The spikelet is straw colored, and very short awns have been observed under certain environmental conditions. The apiculus is straw colored. The endosperm is nonaromatic, nonglutinous, and has a light brown pericarp.

Pirogue is moderately resistant to sheath blight (caused by *Rhizoctonia solani* Kühn), rating a 4.7 on a disease scale of 0 = immune, 9 = highly susceptible in 10 inoculated tests from 2000 through 2002, compared with 5.2 for Bengal. Results from greenhouse evaluations for leaf blast [caused by *Pyricularia grisea* (Cooke) Sacc.] indicated that Pirogue is resistant to race IB-54 but moderately susceptible to susceptible to races IC-17, IB-49, IG-1, and IE-1K. However, results from five field evaluations conducted in Louisiana and Arkansas from 2000-2002 indicate that Pirogue is resistant to rottenneck blast (caused by *Pyricularia grisea* Sacc. = *P. oryzae* Cavara), rating a 0.7 on a disease scale of 0 = immune, 9 = highly susceptible compared with 3.5 for Bengal. Pirogue appears to be highly resistant to the physiological disorder straighthead, rating a 1.1 on a disease scale of 0 = immune, 9 = highly susceptible, compared with 4.0 for Bengal. Pirogue is also resistant to leaf smut (caused by *Entyloma oryzae* Syd. & P. Syd.) and narrow brown leaf spot [caused by *Cercospora janseana* (Racib.) O. Const.], rating a 1.9 and 0.7, respectively, compared with a 2.9 and 0.8 for Bengal, respectively.

Off-types observed and removed from increase fields of Pirogue included any combination of the following: taller, shorter, pubescent, earlier, later, gold-hull, and intermediate grain shape. The total number of off-types was less than 1 per 5000 plants.

Breeder and Foundation seed of Pirogue will be maintained by the Louisiana State University Agricultural Center, Louisiana Agricultural Experiment Station, Rice Research Station, 1373 Caffey Road, Rayne, LA 70578. Limited quantities of seed are available upon request to the corresponding author.

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Table 1. Average paddy, brown, and milled individual grain dimensions and weight of Pirogue, Bengal, and Earl rice grown at Crowley, LA, in 2003.

Cultivar	Length (L)	Width (W)	Thickness	L/W ratio	Weight
	mm				mg
Paddy rice					
Pirogue	**7.26**	**3.47**	**2.28**	**2.09**	**25.6**
Bengal	**8.57**	**3.04**	**2.12**	**2.82**	**26.8**
Earl	**8.51**	**3.12**	**2.15**	**2.73**	**27.1**
Brown rice					
Pirogue	**5.13**	**2.94**	**2.04**	**1.74**	**22.3**
Bengal	**6.34**	**2.67**	**1.93**	**2.38**	**22.8**
Earl	**6.35**	**2.70**	**1.92**	**2.35**	**22.6**
Milled rice					
Pirogue	**4.92**	**2.83**	**1.99**	**1.74**	**20.0**
Bengal	**6.04**	**2.50**	**1.81**	**2.41**	**20.2**
Earl	**6.00**	**2.52**	**1.84**	**2.38**	**20.6**

Registration of 'Forager' Pea

'Forager' (Reg. no. CV-22, PI 634508) pea (*Pisum sativum* L.) is a pure line selection from the Australian landrace pea known as 'Dundale' that was selected for survival in the High Plains of eastern Wyoming and western Nebraska (41–43°N; 103–105°W). Forager was developed by the Wyoming Agricultural Experiment Station and jointly released with the Nebraska Agricultural Experiment Station in 2003. Forager (under the name of Wyodun) was evaluated in 15 and five trials conducted in Wyoming and the Nebraska Panhandle, respectively, between 1995 and 2000.

Forager is indeterminate with a long vine type and purple flowers. It has dimpled seed with yellow cotyledons and a green-brown seed coat. Mean 100 seed weight is 22.3 g. Mean grain crude protein, acid detergent fiber, and neutral detergent fiber from four environments in 1995 were 26.6, 7.3, and 9.3%, respectively. Forager was selected from Dundale (ATC 1000), which was an early maturing selection from 'Early Dun'. Early Dun was probably introduced into Australia from the United Kingdom and has been grown in Australia since the early 1900s. However, the actual origin of Early Dun is unknown. The designation Dundale appeared in Australia in the 1970s and originated from the Department of Agriculture, South Australia. Both Early Dun and Dundale were provided to the University of Wyoming in 1993 free of encumbrances from the South Australian Department of Agriculture. Neither Early Dunn nor Dundale designations were registered as crop cultivars. Upon obtaining seed from South Australia, a planting was made during the summer of 1994 by the Wyoming Agricultural Experiment Station at Torrington, WY. Seed from the surviving plants was collected and cleaned. Off type seed was removed by hand sorting. Further seed purification occurred in 1998 from seed produced at Laramie, WY, before field purification based on purple flower color in 1999 at Powell, WY.

Dry grain yield was evaluated in 20 performance trials from 1995 to 1999 under dryland and irrigated conditions in Wyoming and the Nebraska Panhandle. Forager had a mean dry grain yield of 2020 kg ha^{-1} equal to that of Early Dun and out yielded 'Alma' and 'Wirrega' by 5% and 'Miranda' (PI 600943) and 'Melrose' (PI 618628) by approximately 25%. Forager is earlier to mature than Early Dun by approximately 4 d, which should give it an advantage in yield reliability, especially in a dry spring. In 1999, maturation was recorded at Archer, WY, where Forager and Early Dun were harvest ready 91 and 95 d after planting, respectively, with Forager out yielding Early Dun by 5%.

Forager was compared with 'Arvika' pea for forage production from 2001 to 2003 at a total of four environments. Forager exceeded Arvika in dry matter forage yield by 820 kg ha^{-1}, 4950 compared with 4130 kg ha^{-1}. Across three environments over the same period, Forager exceeded 'Poneka' forage pea in dry matter forage yield by 930 kg ha^{-1}, 5470 compared with 4500 kg ha^{-1}. Forage quality was examined in 2001 and 2002 at two environments. Mean forage crude protein was 21.9, 20.9, and 22.0% for Forager, Poneka, and Arvika, respectively. Mean in vitro dry matter digestibility was 74.1, 73.1, and 76.2% for Forager, Poneka, and Arvika, respectively. Mean acid detergent fiber was 32.1, 33.2, and 29.5% for Forager, Poneka, and Arvika, respectively. Mean neutral detergent fiber was 36.5, 40.7, and 35.8% for Forager, Poneka, and Arvika, respectively. These data indicate that Forager is comparable to Poneka and Arvika in forage quality.

The 1998 seed stock was inspected for *Ascochyta* spp. and laboratory analysis did not detect the pathogen. Beginning in April 2003, the University of Wyoming, Laramie, WY 82071-3354 entered into a 3-yr license and royalty seed marketing agreement with Legume Logic of Crosby, ND 58730. Small quantities of seed are available free of charge for research purposes by contacting the senior author.

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Registration of 'Pacific Gold' Oriental Condiment Mustard

'Pacific Gold' is an oriental spice mustard (*Brassica juncea* L.) (Reg. no. CV-12, PI 633009) developed for use as a condiment by the Idaho Agricultural Experiment Station and officially released on 20 June 1999.

Pacific Gold is a near homozygous pure-line condiment oriental mustard cultivar that was selected for high adaptability to dryland farming regions of northern Idaho and eastern Washington. This cultivar was developed from a single plant selection made in 1993 from an F_4 population involving the cross 'Cutlass'/J.89.102. Cutlass is an oriental mustard cultivar developed by Agriculture and Agri-Food Canada, Saskatoon, SK, Canada. J.89.102 is an accession from the University of Idaho germplasm collection which originated from Agriculture and Agri-Food Canada, Saskatoon, SK, and which was identified as being highly adaptable and having high yield potential for the environmental conditions of northern Idaho.

F_1 seed from the original cross was produced in the spring of 1992 and increased in the greenhouse in the fall of 1992 as the F_1 plant generation and spring of 1993 as the F_2 plant generation. Bulked F_3 seed (derived by open-pollination of eight F_2 plants in the greenhouse) was grown in bulk progeny yield trials in 1994. At harvest, 20 single plants were selected from the bulk progeny and threshed separately for seed increase and to increase homozygosity. From the F_5 stage (1995) through the F_8 stage (1998), a modified-pedigree-bulk breeding scheme was used (Swanston et al., 1981). At each evaluation stage, 20 single plant plots were planted for seed increase and bulk progeny were evaluated in replicated yield trials. Throughout the growing season, the single plant plots were visually inspected for uniformity and homogeneity. An additional 20 single plants were selected from the "best" single plant plots. Thereafter, the remainder of the single plant plots were bulk harvested, hand threshed, and the seed used to plant the following year's yield trials. This operation was repeated for three generations (F_5 to F_6, F_6 to F_7, and F_7 to F_8).

In 1999, 400 single plant selections were made from the F_9 single plant multiplication plots and each plant threshed separately. During the 1999-2000 winter season, two seeds from each plant were planted in 15 cm pots and grown to maturity in the greenhouse. Before flowering, each plant was bagged to minimize cross pollination. At harvest, each plant was harvested separately and evaluated for seed color. Seeds from plants with uniformly yellow-orange seed were retained and used to plant single plant plots in spring 2000. The growth characteristics of the single plant plots were monitored throughout the growing season and any color variants discarded. At harvest, all remaining single plant plots were harvested in bulk as Breeder seed. Foundation seed was planted from this Breeder seed stock in 2000 and increased as Certified seed in 2001.

Pacific Gold was evaluated in replicated field trials grown throughout the dryland agricultural regions of northern Idaho and eastern Washington between 1996 and 2002. Performance of Pacific Gold was compared to the Canadian cultivars Cutlass and 'Lethbridge 22A'. Lethbridge 22A was developed by Agriculture and Agri-Food Canada, Saskatoon, SK, Canada, and released in 1967. These check cultivars represent the majority of the Canadian oriental mustard acreage and are the predominant mustards in this class worldwide. Pacific Gold is the first condiment oriental mustard to be developed for the Pacific Northwest region with no local cultivars available for comparison. Trial results from 1999 through 2002 were obtained from the Pacific Northwest Mustard Variety Trials (Brown et al., 1999, 2000, 2001, 2002).

Plants of Pacific Gold emerge quickly and become rapidly established. Flowering begins 54 d after planting, one day later than Lethbridge 22A, and similar to Cutlass. After flowering, plants average 150 cm in height, similar to Lethbridge 22A, but 4 cm taller than Cutlass. Plants reach physiological maturity on average 105 d after planting. Pacific Gold is highly resistant to lodging and seed shatter at maturity. Pacific Gold is moderately resistant to cabbage flea beetle (*Phyllotreta cruciferae* Goeze) and cabbage seedpod weevil (*Ceutorhynchus assimilis* Paykull), and diamondback moth (*Plutella xylostella* L.).

Seed yield potential of Pacific Gold in the inland Pacific Northwest region is excellent. When planted under conventional tillage systems, Pacific Gold seed yield averaged over 38 trials was 1974 kg ha^{-1}, which was significantly higher than Cutlass (1795 kg ha^{-1}) or Lethbridge 22A (1698 kg ha^{-1}). Pacific Gold planted under no tillage situations had a yield of 1583 kg ha^{-1} averaged over 36 trials, which was significantly higher than either Cutlass (1471 kg ha^{-1}) or Lethbridge 22A (1378 kg ha^{-1}). Pacific Gold was entered into the Pacific Northwest Mustard Variety Trials between 1999 and 2002 at 55 sites and was the highest yielding entry at 44 sites.

Oil content of Pacific Gold (350 g kg^{-1}) was similar to Lethbridge 22A and significantly higher than Cutlass (336 g kg^{-1}). Seed oil fatty acid profile of Pacific Gold was not significantly different from Cutlass. Seed oil fractions contain 30 g kg^{-1} stearic acid, 170 g kg^{-1} oleic acid, 220 g kg^{-1} linoleic acid, 130 g kg^{-1} linolenic acid, 120 g kg^{-1} eicosenoic acid, and 250 g kg^{-1} erucic acid. Total glucosinolate content in Pacific Gold seed was significantly higher (303 μmol g^{-1} of defatted seed meal) than Cutlass (216 μmol g^{-1} of defatted seed meal). The primary glucosinolate in Pacific Gold was 2-propenyl glucosinolate (sinigrin), accounting for over 99% of the total glucosinolates.

Pacific Gold seedlings have small to medium size cotyledons and a semi-upright seedling growth habit at the rosette stage. Leaves are light to mid-green in color with very slight glaucosity. Leaves are pointed and leaf margins have a strong serration. Fully developed leaves are not lobed and the leaf attachment to the main stem shows no clasping. Flower buds appear at the tip of the apical meristem. Flowers are early to medium, beginning to open at 54 d after planting. Petals are bright yellow, and anther dotting is absent. Bilateral single pods (siliques) are semi-erect to erect. Pod length and width is short to medium (37.8 mm long and 4.1 mm wide) with long pedicel length (13.5 mm) and short pod beak (8.5 mm). Pods contain a low number (16.1 seeds pod^{-1}) of bright yellow-orange seeds. Seed size is medium-large with 1000-seed weight similar to Cutlass (2.6 g 1000 seeds^{-1}).

U.S. Plant Variety Protection of Pacific Gold is pending (PVP Certificate no. 200300202). Seed increases are limited to Foundation and Certified classes. Requests for seed of Pacific Gold for commercial production can be made to the Idaho Agricultural Experiment Station, University of Idaho, Moscow, ID 83844-2331. Small amounts (1–25 g) of Pacific Gold seed for experimental purposes can be obtained from the corresponding author for at least 5 yr.

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REGISTRATIONS OF GERMPLASMS

Registration of Hessian Fly Resistant Wheat Germplasm Line P921696

P921696 soft red winter wheat (*Triticum aestivum* L.) germplasm (Reg. no. GP-772, PI 633876) was developed by Purdue University Agricultural Research Programs and USDA-ARS and released in 2003. P921696 has gene *H31*, located on chromosome 5BS (Williams et al., 2003) that confers resistance to Hessian fly [*Mayetiola destructor* (Say)] biotype L. The parentage of P921696 is 'Cardinal'*3/3/'Knox'//CI 15329/CI 3984. CI 15329 (Lebsock et al., 1972) is a durum wheat (*T. durum* Desf.) line that is susceptible to Hessian fly. CI 3984 is a durum wheat accession of the USDA National Small Grains Collection, Aberdeen, ID, that was obtained from Tunisia and that is resistant to Hessian fly biotype L (Cambron et al., 1995).

Cambron et al. (1995) suggested that CI 3984 durum wheat, the donor of *H31* (Williams et al., 2003), has three genes that condition resistance to biotype L and that they are different than the, as yet unnamed, gene in CI 3146 for resistance to biotype L of Hessian fly. The segregation of testcross F_2 families tested against Hessian fly biotype L was 46 segregating for resistance and two susceptible families, which was tentatively interpreted as a four-gene model, although it was noted that additional testcross data were needed for verification of the number of resistance genes in CI 3984. The number of genes for resistance in CI 3984 was reexamined in a backcross test, reported here, in which CI 3984 was crossed to the Hessian fly susceptible durum wheat line, CI 15329, and the resulting F_1 plants were backcrossed to CI 15329. Sixty-three BC_1F_2 families, of 30 seedlings each, were infested with Hessian fly biotype L and placed in a controlled environment chamber at 19.5 C and 12 h photoperiod. Thirty-two families segregated resistant (normal growth) and susceptible (stunted) plants versus 31 families in which all seedlings were susceptible, indicating a single partially dominant gene for resistance in CI 3984. The reliability of the test was excellent; all 61 seedlings of CI 15329 were susceptible and all 63 seedlings of CI 3984 were resistant. In scoring the number of resistant plants in segregating BC_1F_2 families, 91% of heterozygous plants expressed resistance in this test. In light of this evidence for a single gene for resistance to Hessian fly biotype L in CI 3984, the relationship of this gene with the one for resistance in CI 3146 (Cambron et al., 1995) was reexamined in the testcross CI 3146/CI 3984//CI 15329. Testcross F_2 families of 30 seedlings each were infested with Hessian fly biotype L and placed in a controlled environment chamber at temperature and light conditions as described above, and similar to those described by Ratcliffe et al. (2002). All the 160 testcross F_2 families segregated for resistance and no recombinant susceptible families occurred, which indicates that the single resistance gene of CI 3146 and that of CI 3984 are allelic or very tightly linked. The test was very reliable in that all 261 seedlings of CI 15329 were susceptible, all 254 seedlings of CI 3146 and 263 of the 271 CI 3984 seedlings were resistant. The resistance of CI 3984 was highly effective against Hessian fly populations collected from Maryland, Delaware, South Carolina, and Georgia, as well as biotype D in laboratory tests. The resistance of CI 3146 and CI 3984 were slightly different; all seedlings of CI 3146 were resistant to all four populations and all seedlings of CI 3984 were resistant to three of the populations, but 85% of seedlings of CI 3984 were resistant to the population collected in South Carolina (Ratcliffe et al., 2002). The slight difference between CI 3146 and CI 3984 for the South Carolina population could be explained by sampling error, given that the Hessian fly population is likely heterogeneous for virulence. In view of results of our latter experiments, we believe the 42:2 testcross segregation reported by Cambron et al. (1995) may be due to accidental self pollination of the susceptible testcross parent. In our two latter tests described above, the susceptible line CI 15329 was used only as pollen parent.

The inbred line P921696 is the progeny lineage of an F_6 plant that resulted from plant selection in F_2, F_3, F_4, and F_6 generations for resistance to Hessian fly biotype L during inbreeding in a pedigree breeding method following the second backcross to Cardinal, a soft red winter wheat cultivar that is susceptible to Hessian fly biotypes D and L. Typically, 15 to 30 progeny seedlings from F_2, F_3, F_4, and F_6 (not F_5) plants were infested with biotype L flies and placed in a controlled chamber at 19°C, 10-h photoperiod. Resistant (normal growth) and susceptible (stunted) seedlings were scored at 18 d after infestation, similar to test conditions described previously (Cambron et al., 1995).

Plants of P921696 are similar for plant height and spike and kernel characteristics to the recurrent parent, Cardinal. P921696 is a soft red winter wheat. P921696 has neither been tested in performance trials nor for diseases and pests other than Hessian fly. Stems of P921696 are hollow, anthocyanin is absent. Spikes are awnless, fusiform, and lax. Glumes are glabrous, long, midwide, and white at maturity. Anthers are yellow. Kernels are red, long, and elliptical; crease is midwide and middeep; cheeks are rounded; brush is midsized, midlong, and not collared.

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Registration of Three Partial Waxy Winter Wheats

96MD7413-58 (Reg. no. GP-773, PI 617069), 96MD7413-36 (Reg. no. GP-774, PI 617070), and 96MD7110-71 (Reg. no. GP-775, PI 617071) partial waxy (reduced amylose) hard winter wheat (*Triticum aestivum* L.) germplasm lines were released by the ARS, USDA, and the Nebraska Agricultural Experiment Station in November 2002.

These partial waxy wheats carry non-functional (null) alleles (*Wx-A1b* and *Wx-B1b*) at two of the three hexaploid wheat *Wx* loci. These loci encode isoforms of the enzyme granule-bound starch synthase (GBSS, EC 2.4.1.21), also known as the "waxy" protein. Wheats with nonfunctional alleles at two loci are known as "double-nulls." Double-null partial waxy wheats produce endosperm starch with reduced amylose content, relative to that of single-null or wild-type wheats. Such starch confers unique functional properties to derived wheat flour. Suggested uses for partial waxy wheats include a novel source for the production of modified food starches, and a blending agent to create flours with optimal amylose concentration for the production of a variety of sheeted and baked food products (Epstein et al., 2002; Graybosch, 1998). Partial waxy wheats also are useful as donors of the *Wx* null alleles for the breeding of completely waxy (amylose free, triple null) lines. Crosses between double-null partial waxy wheats and completely waxy wheats will result in populations composed of 25% waxy individuals. In comparison, populations derived from crosses between wild-type wheat and waxy wheat will produce waxy progeny at a frequency of only 1/64.

96MD7413-58 and 96MD7413-36 were both descended from the cross NE90616/'Ike', while 96MD7110-71 was derived from MT8713/NE87612//Ike. Ike ('Dular'/'Eagle'//2*'Cheney'/'Larned'/3/'Colt') is the source of the double-null trait for all three lines. Ike is a hard red winter wheat released by the Kansas Agricultural Experiment Station in 1994. To date, Ike is the only known double-null partial waxy wheat cultivar released for cultivation in North America, and in 2003, was seeded on approximately 2% of the total wheat acreage in Kansas (http://www.nass.usda.gov/ks/whtvar/whtvar03.pdf; verified 17 June 2004). NE90616 ('Arapahoe'/Colt 83 composite) is a hard winter wheat breeding line developed by the University of Nebraska. Colt 83 composite was an unreleased reselection from the cultivar Colt. NE87612 ('Newton'/'Warrior' 5*/'Agent'/3/NE69441) also is a hard winter wheat breeding line from the University of Nebraska. The pedigree of NE69441 was 'Ponca'/3*'Cheyenne'/3/'Kenya58'/'Newthatch'/2/2*CTMH/4/'Scout'. The pedigree of CTMH is Cheyenne-'Tenmarq'-'Mediterranean'-'Hope' where the order of the crosses is unknown. MT8713 (PI 564762), ('Roughrider'//TX 55-391-56-D8/'Westmont'), a sib line of the cultivar Erhardt, is a hard red winter wheat breeding line developed by Montana State University. TX55-391-56-D8 was descended from 'Sinvalocho'/'Wichita'//'Hope'/'Cheyenne'/3/Wichita/4/'Seu Seun 27'.

The three germplasm lines were developed as follows: F_1 plants were grown in the greenhouse at Lincoln, NE. F_2 and F_3 populations were seeded at Mead, NE, in 1994 and 1995, respectively. No selection other than winter-survival was exercised during the F_2 and F_3 generations. In 1996, head selections were made from F_3 bulk populations grown at Mead, NE. Starch was purified from a bulk sample of 8 seed per head; starch-granule proteins were purified and separated by gel electrophoresis as described by Nakamura et al. (1995) to identify *wx* loci genotypes. The *wx* genotypes are easily identified by electrophoretic migration patterns of the waxy protein isoforms. Remnant seed of each head was seeded in unreplicated rows at Berthoud, CO, in February 1997. Each line was selected from a single $F_{3:4}$ rows. The release of these partial waxy lines expands the number of available genetic backgrounds carrying the double-null trait in wheat.

In crop year 1998, starch amylose concentrations of 96MD7413-58, 96MD7413-36, and 96MD7110-71, based on means from two environments, were 184, 184, and 179 g kg^{-1}, respectively. In comparison, amylose concentrations of Ike (double-null), 'TAM-202' (*wx-B1b*, single null), 'Redland' (wild type) and 'Vista' (wild type) were 189, 212, 233, and 237 g kg^{-1}, respectively. In replicated yield trials in 4 Nebraska environments over the 1999 and 2000 crop years, grain yields of 96MD7413-58, 96MD7413-36, and 96MD7110-71 averaged 2822, 2859, and 2675 kg ha^{-1}, respectively. In the same environments, the check cultivars Arapahoe, Ike, Redland, TAM202, and Vista averaged 2344, 2990, 2709, 2920, and 2706 kg ha^{-1}, respectively. Respective volume weights of 96MD7413-58, 96MD7413-36, and 96MD7110-71 were 66.6, 76.3, and 69.7 kg hL^{-1}, as opposed to volume weights of 65.5, 77.3, 64.5, 74.2, and 71.1 kg hL^{-1} for Arapahoe, Ike, Redland, TAM202 and Vista.

96MD7413-58, 96MD7413-36, and 96MD7110-71 were entered in the USDA-ARS coordinated Northern Regional Performance Nursery (NRPN) in 2001. Over 12 production environments in the northern Great Plains in 2001, respective mean grain yields of 96MD7413-58, 96MD7413-36, and 96MD7110-71 were 4035, 3849, 3853 kg ha^{-1}, as opposed to respective grain yields of 3921, 3857, 3952 kg ha^{-1} for the check cultivars 'Abilene', 'Nekota', and 'Trego'. Volume weights of grain harvested from 2001 trials of 96MD7413-58, 96MD7413-36, and 96MD7110-71 were 72.9, 74.6, and 77.2 kg hL^{-1}, as opposed to volume weights of 77.7, 75.8, and 78.1 kg hL^{-1} for the check cultivars Abilene, Nekota, and Trego. Over the same production environments, plant heights of 96MD7413-58, 96MD7413-36, and 96MD7110-71 averaged 75, 76, and 69 cm, respectively. Average respective plant heights of Abilene, Nekota, and Trego were 66, 71, and 69 cm. Average respective days (from January 1st) to heading for 96MD7413-58, 96MD7413-36, 96MD7110-71, Abilene, Nekota, and Trego were 159, 159, 158, 158, 158, and 158. On the basis of observations from nine 2001 production environments in the northern Great Plains, 96MD7413-58 and 96MD7413-36 are less winter hardy than Abilene, Nekota, and Trego while 96MD7110-71 is more winter hardy than Abilene and Nekota, and equal to Trego. All three germplasm lines are intolerant of acid soils.

White salted noodle quality of 96MD7413-58, 96MD7413-36, and 96MD7110-71 was tested on samples from three environments harvested in 2000. Relative to Arapahoe, Redland, and TAM202, all three produce softer-textured cooked noodles, equal in softness to that of Ike. Color stability, as measured by changes over 24 h in Minolta Colorimeter (Chroma Meter CR-210, Minolta Camera Co. Ltd, Osaka, Japan) L* (brightness), a* (redness), and b* (yellowness) values, from all three lines was similar to that of Arapahoe, Redland, and TAM202, but slightly less stable than that of Ike. Additional quality testing of samples of 96MD7413-58, 96MD7413-36, and 96MD7110-71 from the 2001 NRPN revealed that sound grain from all three lines had significantly lower stirring numbers (as determined by the Rapid Visco Analyser), than all other entries. The lower stirring numbers indicate altered starch cooking properties. 96MD7413-58 and 96MD7413-36 produce stronger doughs than the NRPN check cultivar Abilene, while dough strength of 96MD7110-71 is slightly weaker than that of Abilene. Loaf volumes of all three lines are similar to Abilene, but all three also produce loaves with less desirable internal appearance (loaf grain). The poor loaf grain is related to the altered starch properties, and suggests that partial waxy wheats, if cultivated for their unique starches, should be separated in marketing channels from typical hard winter wheats.

96MD7413-58, 96MD7413-36, and 96MD7110-71 are red seeded, hard grained, awned, winter wheats. All three are heterogeneous for unidentified resistance genes to Hessian fly (*Mayetiola destructor* Say), but are susceptible to greenbug (*Schizaphis graminum* Rondani) and Russian wheat aphid (*Diuraphis noxia* Mordvilko). All three also are moderately resistant to present prevalent races of stem rust (caused by *Puccinia graminis* Pers.: Pers.). 96MD7413-58 and 96MD7413-36 are postulated to carry *Sr6*, *Sr17*, and *Sr24*, while 96MD7110-71 is postulated to carry *Sr17* and *Sr36*. All three are susceptible to common races of leaf rust (caused by *Puccinia recondita* Roberge ex Desmaz.). 96MD7413-58 has some tolerance to infection by *Wheat soilborne mosaic virus*, while the other two lines are moderately susceptible.

Seed of all lines has been deposited in the USDA National Small Grains Collection, Aberdeen, ID. Small quantities of seed may be obtained from R. Graybosch, USDA-ARS, University of Nebraska, Lincoln, NE 68583. It is requested that the source of this material be acknowledged in future usage by wheat breeding and genetics programs.

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Registration of NPM-4, a Dwarf White Grain Pearl Millet Germplasm

Dwarf grain pearl millet [*Pennisetum glucum* (L.) R. Br.] germplasm NPM-4 (Reg. no. GP-37, PI 634545) was released in September 2003 by the Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln, NE.

NPM-4 was derived from open-pollinated outcrosses of white grain inbred line 57028R_1w grown in a 1998 Puerto Vallarta winter nursery. The source of the outcross pollen was from primarily genetically diverse, dwarf, early maturing, gray seeded lines being developed as parents for grain yield. Line 57028R_1w was derived from 89C57028R_1/3*90PV0121. Line 89C57028R_1 is gray-seeded, and line 90PV0121 has white seed. Line 90PV0121, an F_5 was derived from the cross 85C53005/ZW10. Line 89C57028R_1 was an A_1 (Burton, 1958) cytoplasmic nuclear male-sterility (cms) restorer S_5 selection out of row 84M:17101-1 of segregating germplasm obtained in the late 1970s from Dr. A.J. Casady, Kansas State University, that had undergone random mating and selection for at least 3 cycles before 1984. Line 85C53005 was an A_1 maintainer S2 selection (84H:14014) also from the segregating Casady germplasm. The line ZW10 was a white seeded introduction from Zambia obtained in 1988. The 1998 winter nursery outcrosses of 57028R_1w were grown in isolation at the Department of Agronomy Farm at the University of Nebraska's Agricultural Research and Development Center (ARDC), Mead, NE, in 1998 and productive dwarf white seeded plants were selected for harvest and bulked together. The harvested bulk was grown in 1999 at Mead and plants were selfed and selected for all white seed on panicles. The white seeded selfs were grown in isolation in 2000. Nineteen open-pollinated white grain selections were made and random mated in isolation in 2001. Open pollinated seed of the best six white grain families was combined to form the bulk for seed release. Final selection was for panicle size, kernel size, and lodging resistance. Topcrosses of NPM-4 with cms lines NE68A_1, NE59043A_1, and KS1163A_1 (a CMS A_1–line from W.D. Stegmeier, Kansas State University-Hays) in 2002 indicated that NPM-4 was a good restorer of A_1 cms with good combining ability for grain yield.

NPM-4 is a medium maturity, dwarf, tillering germplasm that averages between 85 and 100 cm in height at maturity. It flowers between 55 and 72 d after early June to early July plantings (Mead ARDC) and grain yields from 1370 to 2170 kg ha^{-1} have been recorded. Yields of NPM-4 topcross hybrids on three seed parents averaged 89, 85, and 115% higher than NPM-4 in early, normal and late planting, respectively. Seed of NPM-4 is white to cream in color, and has obovate, hexagonal, and spherical shapes with a size range of 6.9-17.3 g 1000^{-1} measured on individual panicles. NPM-4 has compact candle-shaped panicles with a range in size of 17 to 28 cm in length (21.7-cm mean length) and 2.1 to 3.5 cm in diameter and good panicle exertion. Anthers are yellow in color and shed pollen profusely. Insect and disease reaction of NPM-4 have not been determined. NPM-4 produces 1-2 tillers per plant, which are upright in habit at high and low planting densities. NPM-4 has value for direct use as an open-pollinated white grain germplasm for food grain production and as an A1 restorer germplasm for producing medium to medium-early maturing white grain hybrids. White to cream colored grain is preferred for producing more appealing food products. Limited yield performance tests of NPM-4 topcross hybrids indicate NPM-4 has good combining ability for grain yield with early to medium maturity white grain seed parents.

Seeds of NPM-4 are available for research purposes from the Department of Agronomy, University of Nebraska, Lincoln, NE 68583.

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Registration of NPM-8, a Dwarf Grain Pearl Millet Germplasm with Long Panicles

NPM-8 pearl millet [*Pennisetum glaucum* (L.) R. Br.] (Reg. no. GP-38, PI 634549), a dwarf grain germplasm with long panicles containing restorer genes for the A_1 (Burton, 1958) and A_4 (Hanna, 1989) cytoplasmic-nuclear male sterile (cms) cytoplasm systems, was released in January 2004 by the Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln, NE.

NPM-8 was derived from the Nigerian Dwarf Composite (NCD2) germplasm (Rai et al., 1995) by selection of dwarf phenotypes adapted to eastern Nebraska conditions and primarily represents pooled diversity from Nigerian and West African long panicle landraces converted to a dwarf plant background. NCD2 grown in Nebraska produces predominately very late, medium tall (120–180 cm) phenotypes with significant panicle lodging. A 1990 isolation of NCD2 grown at Mead, NE, was selected for maturity and medium dwarf plants. Open pollinated selections of five plants were bulked and grown at Lincoln in 1991. Twenty-nine medium dwarf self pollinated S_1 selections from Lincoln nursery were advanced for random mating with equal maternal representation at Mead in 1992. Ten S_1 families were selected with less than 40% lodging, 135 cm height or less, and medium to long head length. The open pollinated bulks of the ten families were random mated with equal maternal representation at Mead from 1993 to 1995 with continued selection for dwarf plants, panicle length, and lodging resistance. In the 1996 isolation, the best two individual dwarf plants of the 10 families were self-pollinated. The progeny from these selections were random mated in 1997 with equal maternal representation. Open-pollinated selection for dwarf plants, long panicle, and lodging resistance was continued in 1998 through 2001 isolations. Final selections were made in 2001, and harvested seed was bulked for release.

NPM-8 topcrosses were obtained by planting male sterile lines in the 2001 isolation plot. NPM-8 and its topcrosses were planted on 1 June, 15 June, and 2 July 2002. Male fertility (pollen shedding) counts showed averages of 56 to 73% restoration of two A_1 cms lines and 3 to 11% restoration of an A_4 cms line. Pollen shedding counts of NPM-8 indicated all plants were male fertile.

NPM-8 is a dwarf, medium maturing, tillering germplasm that averages between 98-123 cm height at maturity. It flowers between 57 and 66 d after early June to early July plantings at Mead and has a 5- to 10-d range between first plants flowering and average flowering dates for the germplasm. Grain yields from 1620 to 2910 kg ha^{-1} have been recorded. Hybrids with three seed parents exhibited heterosis levels of 40 to 158% among three planting dates, with a best hybrid yield of 4709 kg ha^{-1}. Seed of NPM-8 is gray in color, variable in shape with a size range of 4.8 to 11.3 g/1000. Panicles vary from 24- to 45-cm length and 1.7- to 2.5-cm diameter and have good exertion. When grown at Mead, the mean panicle length of NPM-8, 31.0 cm, was significantly longer than the mean length of NPM-1, NPM-2 (Andrews et al., 1995), and NPM-3 (Andrews and Rajewski, 1995), 19.6, 18.7, and 23.0 cm, respectively, across three planting dates. Insect and disease reaction of NPM-8 have not been determined.

NPM-8 provides an adapted germplasm source of predominantly West African background from which dwarf lines with long panicles can be derived for use in the A_1 and $A_{4\,cms}$ systems as R_1–lines (male parents) or A_4–lines (seed parents) for producing medium maturing dwarf grain hybrids. Limited yield performance tests of NPM-8 topcross hybrids indicates that the germplasm has good combining ability for grain yield with medium and early maturity seed parents.

Seeds of NPM-8 are available for research purposes from the Department of Agronomy, University of Nebraska, Lincoln, NE 68583

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Registration of CP07 and CP08 Sugarbeet Germplasms with Resistance to Powdery Mildew, Rhizomania, and Other Diseases

Sugarbeet (*Beta vulgaris* L.) germplasm lines CP07 (Reg. no. GP-244 PI 632288) and CP08 (Reg. no. GP-245, PI 632289) were developed by the USDA-ARS in cooperation with the Beet Sugar Development Foundation (BSDF) and the California Beet Growers Association. They were released in 2003. CP07 and CP08 are multigerm (*MM*), germplasm lines that segregate for resistance to powdery mildew (*Pm*) (Lewellen and Schrandt, 2001) caused by *Erysiphe polygoni* DC. and rhizomania (*Rz1*) (Lewellen et al., 1987) caused by *Beet necrotic yellow vein virus*. In addition, CP07 and CP08 may have resistance to rhizomania conditioned by factors from *B. vulgaris* subsp. *maritima* (Lewellen & Whitney, 1993). They segregate for hypocotyl color and are likely self-sterile (S^sS^s) although segregation for self-fertility (S^f) is possible.

As a line and in experimental hybrids, CP07 shows moderate resistance to sugarbeet *Erwinia* caused by *E. carotovora betavasculorum* Thomsen et al. and bolting tendency. It is intermediate for reaction to *Beet curly top virus*, similar to C78/3 (Lewellen, 2004a). It may show tolerance or have reduced infestation counts to sugar beet cyst nematode (*Heterodera schachtii* Schmidt) based on field observations (Lewellen, unpublished). At Salinas, in the absence of rhizomania, it has lower sugar yield and sucrose concentration than the mean of four commercial hybrid checks. Under rhizomania, it has higher sugar yield than and equal sucrose concentration to the mean of these same rhizomania resistant checks. At Brawley, CA, under both rhizomania and nonrhizomania conditions, it had higher sugar yield and sucrose concentration than these rhizomania resistant commercial checks and other experimental lines and hybrids that depended solely on the *Rz1* factor for resistance to rhizomania. At Brawley, the late season survival and appearance score was very good and similar to C927-4 (PI 628756) (Lewellen, 2004b). In the bolted phase, CP07 segregates for determinate growth of stems. As far as is known, this is a previously undescribed morphological trait that causes the stem to abruptly end in a flower or cluster of flowers. On the bolted stems, most leaf axils have only flowers but not lateral branches. From one to many internodes are formed before stem termination.

At Salinas, in 1999, 15 individual plants were selected from among three backcross families. These mother roots were selected for resistance to rhizomania, high resistance to powdery mildew, and nonbolting. Earlier in 1999, these same three backcross families were observed to segregate for high resistance and survival to rhizomania under high temperature, severe rhizomania conditions in Imperial Valley tests. The recurrent parents leading to CP07 were C37 (PI 590715) (Lewellen et al., 1985), C72 (PI 599342), and C78/3 (PI 628752). The final two backcrosses were to C78/3. The donor parents had germplasm from *B. vulgaris* subsp. *maritima* that contributed resistance to powdery mildew and rhizomania. It is estimated that CP07 has about 72% of its germplasm from C78/3, 24% from C37, 3% from *B. vulgaris* subsp. *maritima* through C72 from C51 (PI 593694) (Lewellen, 2000b), and 1% from both WB97 (PI 546394) and WB242 (PI 546413) (Lewellen, 2000a). Of the six parental plants in the final backcross, three plants were C78/3, and three had C51 germplasm in their background. Of the latter three plants, two also had germplasm from WB97 and one from WB242. It is believed that resistance to powdery mildew (*Pm*) was derived from WB97 and/or WB242 (Lewellen & Schrandt, 2001) and resistance to rhizomania from C78/3 (*Rz1*) and C51 and/or WB97 and WB242 for high resistance and survival under high temperature, severe rhizomania conditions. The 15 plants selected in 1999 were increased in mass in 2000 to produce P007/8. Line P007/8 was reselected in 2001 under natural powdery mildew, rhizomania, and cyst nematode infested conditions for resistance to powdery mildew and rhizomania and freedom from infestation with nematodes to produce P207/8. Line P207/8 was released as CP07.

CP08 shows intermediate nonbolting tendency. At Brawley, CA, under rhizomania conditions, it has higher sugar yield and sucrose concentration than lines with similar germplasm and parentage. At Brawley, the late season survival score is superior to most other entries. Under moderate to severe rhizomania and unknown soil-borne problems at Brawley, the canopy of CP08 remains dark green. This appears to be due to a combination of high resistance to rhizomania and/or other soil-borne factors, e.g., possibly sugar beet cyst nematode, high resistance to powdery mildew, and resistance to phytotoxemia from the feeding of *Empoasca* leafhoppers (*E. fabae* Harris and *E. solana* DeLong).

CP08 was increased from one full-sib line that in progeny tests in 2000 at Brawley and Salinas, segregated for high resistance to powdery mildew, resistance to rhizomania, and, under severe rhizomania, segregated for very good appearance and survival scores under high temperatures. This full-sib progeny resulted from backcrosses to transfer and combine *Pm* and *Rz1*. A number of powdery mildew resistant plants from CP02 (Lewellen, 2000a) were backcrossed to plants of C78/3, the source of *Rz1*. Individual plants from this series of backcrosses that appeared to be resistant to powdery mildew and rhizomania were backcrossed by paired crosses in the greenhouse under paper bags to plants from C37. Backcross P918-6 was selected from progeny tests in 2000 and increased to produce line P118-6. Seed of P118-6 was released as CP08 and further tested as P318-6. About 2% of CP08 was derived from WB242, 25% from C78/3, and 73% from C37. Under severe rhizomania and high temperature conditions, CP08 is strikingly different from C78/3 and C37 for resistance to rhizomania, powdery mildew, and the feeding effects of *Empoasca*. Under these conditions at Brawley, CP08 has a very desirable, dark green appearance that gives the canopy a "stay-green" tendency.

Lines CP07 and CP08 should be evaluated as sources from which to develop potential pollinators for high performing, disease and bolting resistant hybrids. These lines may be useful as a combined source of high resistance to powdery mildew and rhizomania. They need to be evaluated further as a potential source of tolerance to cyst nematode and *Empoasca* leafhoppers.

Breeder seed is maintained by the USDA-ARS and will be provided to sugarbeet researchers in quantities adequate for reproduction, on request to the author (rlewellen@pw.ars.usda.gov). U.S. Plant Variety Protection will not be requested for CP07 and CP08.

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Registration of ARS-2424 Birdsfoot Trefoil Germplasm

ARS-2424 (Reg. no. GP- 11, PI 633724) broad-leafed birdsfoot trefoil (*Lotus corniculatus* L.) hybrid germplasm was released by the USDA-ARS in cooperation with the Missouri Agricultural Experiment Station in March 2003. The merit of ARS-2424 is that it is a rhizome-producing birdsfoot trefoil that includes a big trefoil (*L. uliginosus* Schkur.) parentage. Such germplasm is important because it expands the germplasm resource allowing plant breeders to develop rhizomatous cultivars with diverse attributes for different environments.

ARS-2424 was developed from the mating of the nonrhizomatous *L. corniculatus* × *L. uliginosus* hybrid G4712 with five wild germplasm accessions from Morocco (PIs 631539–542 and G31217). G4712 ($2n = 4x = 24$) was provided by the Margot Forde Forage Germplasm Center, AgResearch, Palmerston North, New Zealand. The Moroccan parents were used as the source of the rhizomatous trait. Matings with MU-81 (Beuselinck and McGraw, 1986) as the maternal parent produced F_1 progeny that were verified using molecular techniques. Genetic studies have determined that expression of rhizomes is a simply inherited, dominant trait. The F_1 progeny were established at a field site near Columbia, MO, in June 1994 and evaluated through spring 1997. Progeny were evaluated for rhizome production, vigor, dry-matter production, forage quality, incidence of disease, seed production, and winter hardiness. Selected progeny were vegetatively propagated to produce ramets. The ramets were planted in isolation at Columbia, MO, for open-pollinated seed production in 1998. ARS-2424 is the result of three cycles of open-pollinated recombination in the field with honey bees (*Apis mellifera* L.) and native *Bombus* spp. as pollinators. Equal numbers of seed collected from each plant were mixed to produce Cycle 1 in 1998. Cycle 1 seed was planted, allowed to random mate, and Cycle 2 seed was bulk harvested in August 2000. Cycle 2 seed was planted, allowed to random mate, and Cycle 3 seed was bulk harvested in 2002. Cycle 3 seeds were designated as ARS-2424.

Plants from ARS-2424 are variable in morphology. Plants are semierect, with medium- to large-sized leaves and medium- to coarse-sized stems. Individual plants can be aggressive rhizome producers with large crowns developing from prolific rhizome production. The expression of rhizomes can be influenced by genetic background, management practices, environmental conditions, and other factors. Flower color varies from yellow to orange. ARS-2424 contains a large number of early-flowering plants. Condensed tannin concentration in foliage is similar to that found in *L. corniculatus*. ARS-2424 is cross-compatible with other *L. corniculatus*.

Limited amounts of seed of ARS-2424 will be provided on written request as supplies permit. Recipients are asked to recognize the source of the germplasm if it contributes to the development of a cultivar or germplasm, or is used for other research purposes. Address seed requests to P.R. Beuselinck.

P.R. Beuselinck*

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Registration of CR-34 and CR-81 Safflower Germplasms with Increased Tocopherol

Two safflower (*Carthamus tinctorius* L.) germplasms were developed and released by the Institute for Sustainable Agriculture (CSIC) at Córdoba, Spain, in 2002. CR-34 (Reg. no. GP-36, PI 634711) and CR-81 (Reg. no. GP-37, PI 634712) are characterized by an increased level of tocopherols in the seeds, mainly α-tocopherol. Increased tocopherol content in both germplasms was largely determined genotypically, being consistently expressed across several environments.

One hundred thirty-two accessions from the USDA-ARS safflower germplasm collection at the Western Regional Plant Introduction Station (WRPIS), Pullman, WA, were selected on the basis of their tocopherol content and composition. The accessions had been evaluated by Johnson et al. (1999), with the data available at the Germplasm Resources Information Network (GRIN) website (www.ars-grin.gov/npgs/; verified 17 June 2004). Selections included accessions with high total tocopherol content. After three cycles of selection and two further field evaluations at Córdoba (southern Spain), CR-34 and CR-81 were selected and released on the basis of their consistent high tocopherol content in the seeds.

CR-34 was derived from PI 304597, a cultivated accession collected in Afghanistan. CR-81 was selected from PI 406001, a cultivated accession collected in Iran. Single seeds of PI 304597 and PI 406001 were nondestructively analyzed for tocopherol content by the half-seed technique (Goffman et al., 1999). Single seeds showed a wide range of variation for tocopherol content, from 168.8 to 569.8 mg kg^{-1} in PI 304597 and 196.0 to 524.6 mg kg^{-1} in PI 406001. Seeds with high tocopherol content from both accessions were germinated and the corresponding plants were grown in pots in a field screenhouse in 1999. Plants of the cultivar Rancho were grown as a check. Rancho is a low oleic acid cultivar developed by the single seed descent method and is used as a standard cultivar for testing in Spain (Fernández-Martínez et al., 1986). Analysis of individual plants derived from accessions PI 304597 and PI 406001 revealed tocopherol contents of 773.1 ± 116.4 mg kg^{-1} and 727.4 ± 61.7 mg kg^{-1}, respectively, compared to 604.2 mg kg^{-1} in plants of Rancho. The progenies of the plants with the highest tocopherol content were selected and subjected to an additional cycle of selection in 2000, following a plant-to-row scheme. The best families were selected and their seeds were pooled to form the CR-34 and CR-81 germplasms. Both germplasms were evaluated in a nonreplicated field trial in 2001 and a replicated field trial in 2002, both at Córdoba, Spain. Total tocopherol content in CR-34 was 708.4 ± 89.9 mg kg^{-1} in 2001 and 650.6 ± 49.0 mg kg^{-1} in 2002. Total tocopherol content in CR-81 was 758.6 ± 49.6 mg kg^{-1} in 2001 and 678.6 ± 52.9 mg kg^{-1} in 2002. The cultivar Rancho had a tocopherol content of 538.2 ± 49.3 mg kg^{-1} in 2001 and 439.0 ± 33.6 mg kg^{-1} in 2002. The tocopherol fraction in both germplasms was largely made up of α-tocopherol, which accounted for $97.1 \pm 0.4\%$ of the total tocopherols in CR-34 and $97.0 \pm 0.6\%$ in CR-81, compared to $97.8 \pm 0.4\%$ in Rancho.

Plants of CR-34 have a plant height of 181.5 ± 4.3 cm and are spiny with orange flowers. CR-34 is also characterized by a 1000-seed weight of 24.2 ± 3.2 g and seed oil content of 345 ± 26 g kg^{-1}. Plants of CR-81 are nonspiny, with both orange and red flowers, and have a plant height of 192.6 ± 5.1 cm. CR-81 has a 1000-seed weight of 33.2 ± 4.8 g and seed oil content of 311 ± 14 g kg^{-1}.

Among the tocopherols, α-tocopherol possesses the greatest biological activity as an in vivo antioxidant, also known as vitamin E activity (Pongracz et al., 1995). Despite being a minor crop, safflower is highly valued worldwide because of the nutritional properties of its seed oil, both in the traditional high linoleic acid type, as well as in the more recent high oleic acid type (Dajue and Mündel, 1996). The enhancement of the α-tocopherol and vitamin E content in the seeds will contribute to a greater nutritional value of the oil. CR-34 and CR-81 are valuable genetic sources for enhancing the vitamin E content of safflower cultivars.

Breeder seed of CR-34 and CR-81 will be maintained by CSIC and will be provided on request to the corresponding author. Appropriate recognition is requested if these germplasms contribute to research programs or the development of new germplasm. U.S. Plant Variety Protection will not be requested for CR-34 and CR-81.

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Registration of GA98033 Upland Cotton Germplasm Line

GA98033 cotton (*Gossypium hirsutum* L.) (Reg. no. GP-786, PI 634766) germplasm line was developed by the Georgia Agricultural Experiment Station (GAES) and released in 2004. GA98033 combines high yield potential, acceptable fiber quality, resistance to Fusarium wilt (caused by *Fusarium oxysporum* Schlecht f. sp. *vasinfectum* Atk. Sny. & Hans.), and is conducive to plant regeneration through tissue culture somatic embryogenesis.

The pedigree of GA98033 is PD5529/'SG125'. PD5529 is a germplasm line with pedigree 'Deltapine 41'/PD6133 (Green et al., 1991), while SG125 is a SureGrow Seed cultivar with parentage 'Deltapine 50'/3*'DES 119' (Calhoun et al., 1997). The PD5529/SG125 F_1 was created in 1994, self-pollinated at the 1994-1995 USDA-ARS Cotton Winter Nursery in Mexico, and F_2 seed was then combined from about 15 F_1 plants. This bulk F_2 population was tested in a replicated trial in 1995 at Florence, SC and was selected for advance to the F_3 generation in 1996 because it had higher seed cotton yield ($P < 0.10$) than the trial check, germplasm line PD-3-14 (May et al., 1996). In 1996 F_3 plants were visually selected for boll production, were individually harvested, and subsequently planted to F_4 progeny rows in 1997. The $F_{3:4}$ progeny rows were visually compared with the nearest plots of 'SureGrow 501' for yield potential and $F_{4:5}$ seed of selects was bulked for replicated trials beginning in 1998. GA98033 derives from $F_{7:8}$ seed combined from selected plants within an F_7 seed increase plot produced in 2000 at Tifton, GA.

In 2002 or 2003 Official Cultivar Trials, GA98033 consistently yielded more than the popular cultivars Deltapine 448B, Deltapine 451BRR, Deltapine 458BRR, Deltapine 655BRR, Deltapine 5415RR, Deltapine 5690RR, FiberMax 991RR, FiberMax 989RR, Stoneville 5303RR, and Stoneville 5599BRR (USDA-AMS, 2003). Averaged over 2002 and 2003, lint yield of GA98033 exceeded ($P < 0.10$) that of Deltapine 448B, Deltapine 458BRR, Deltapine 5415RR, Deltapine 5690RR, FiberMax 989RR, and FiberMax 991RR in the University of Georgia Dryland and Irrigated Later Maturity Cultivar Trials (Day et al., 2003; 2004). Averaged over three trials comprising the 2002 South Carolina Cotton Cultivar Later Maturity Trials, GA98033 yielded more ($P < 0.10$) than Deltapine 448B, Deltapine 451BRR, Deltapine 655BRR, FiberMax 989BRR, Stoneville 5599BRR, and Stoneville 5303RR (Barefield, 2002). Lint fraction of GA98033 averaged 40% in the 2002 and 2003 Georgia trials, less ($P < 0.10$) than that of Stoneville 4892BR (42.1%), but greater ($P < 0.10$) than that of FiberMax 991RR (38.8%).

Fiber quality of GA98033 is mainly comparable to the cultivars listed above. For example, upper half mean fiber length measured by high volume instrument averaged 28.2 mm and length uniformity index of GA98033 averaged 83.5%, equivalent to those of Deltapine 448B and Deltapine 458BRR (Day et al., 2003; Day et al., 2004). Averaged over 2002 and 2003 from the irrigated and nonirrigated University of Georgia Official cultivar trials (16 trials), fiber strength of GA98033 (312 kN m kg^{-1}) was slightly greater than those of Deltapine 448B (287 kN m kg^{-1}) and Deltapine 458BRR (303 kN m kg^{-1}; $P < 0.10$). In the same 16 trials, micronaire reading of GA98033 (4.7) was not different than those of Deltapine 448B (4.6) and Deltapine 458BRR (4.8; $P > 0.10$).

GA98033 is embryogenic and has regeneration frequency from somatic embryos into plantlets similar to that of Coker 312 (Sakhanokho et al., 2004), a feature that may permit utility as a recipient of transgenic traits. Although the range of germplasm capable of embryogenesis has expanded in recent years, almost all commercial applications of cotton transformation are still performed in Coker 312 or close relatives (Rajasekaran et al., 2001). An embryogenic germplasm with yield potential commensurate or exceeding that of many currently popular cultivars could have value as a donor parent for new transgenic traits, compared with the agronomic potential of Coker 312 that was released in 1972 (Calhoun et al., 1997).

GA98033 expressed resistance to the Fusarium wilt infesting the 2002 National Cotton Fusarium Wilt Test (Glass et al., 2002). Seasonal percent wilted plants of GA98033 (5.3%) were not different than that of the resistant germplasm line M-315-RNR (0.8%; LSD 0.05 = 13.2%), but was significantly less than that of susceptible Rowden (56.5%; Shepherd et al., 1996).

GA98033 should be useful to breeders as a source of high yield potential and acceptable fiber quality, and potentially molecular biologists for transformation research. Seed of GA98033 will be maintained by the GAES and has been entered into the USDA National Plant Germplasm System for long-term curation and availability. Small quantities of seed (25 g) may be requested from the corresponding author. Requests for seed from outside the USA cannot be filled without an import certificate allowing the seed to enter the requestor's country. The University of Georgia may not be able to certify that seed of GA98033 is free of certain insects and pathogens specified on an import certificate, and in such instances seed of GA98033 cannot be supplied. Recipients of seed are asked to make appropriate recognition of the source of the germplasm if it is used in the development of a new cultivar, germplasm, parental line, or genetic stock.

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REGISTRATIONS OF PARENTAL LINES

Registration of B117, B118, B119, B120, and B121 Inbred Lines of Maize

Inbred B117 (Reg. no. PL-316 PI 634211), B118 (Reg. no. PL-317, PI 634212), B119 (Reg. no. PL-318, PI 634213), B120 (Reg. no. PL-319, PI 634214), and B121 (Reg. no. PL-320, PI 634215) are yellow maize (*Zea mays* L.) inbred lines developed jointly by the Iowa Agriculture and Home Economics Experiment Station and USDA-ARS. The inbred lines were released 1 July 2003 for their potential value as either parent lines for hybrids or as source germplasm in inbred development programs.

B117 was derived from an F_2 population developed by selfing the cross of B97 (Hallauer et al., 1994) and B99 (Hallauer et al., 1995). Pedigree selection was used in the development of B117, whose pedigree is (B97 × B99)-024-1-1-2-1-1-1-1-B. S_1 progenies derived from the (B97 × B99) F_2 population were screened in the breeding and pest nurseries for plant type, maturity, ear size and seed set, synchrony of silk emergence and pollen shed, root and stalk strength, and resistance to first and second generations of European corn borer (*Ostrinia nubilalis* Hübner), northern corn leaf blight (caused by *Exserohilum turcicum* Pass.), gray leaf spot (caused by *Cercospora zeae-maydis* Tehan and Daniels), and common corn rust (caused by *Puccinia sorghi* Schw.). Greater root strength was emphasized among S_1 progenies in the breeding nursery because of the poor root strength of B97. At the S_2 generation progenies were included in the topcross nursery, with a B73-related line as the tester. Inbreeding and selection were continued among S_2 progenies and subsequent generations during the testing phases. On the basis of 2-yr testcross trials selected progenies were advanced by selfing and crossed to BSSS lines. Single cross trials were conducted at 10 Iowa locations in 2000, 15 in 2001, and 14 in 2002. In all instances, crosses that included B117 as one parent exhibited consistently good grain yields either comparable to or better than the check hybrids. Stand levels, grain moisture at harvest, root and stalk strength, and days to flower were similar to the check hybrids.

B117 is a vigorous line that has good tolerance to first and second generation European corn borer, gray leaf spot, and northern corn leaf blight. The phenotype of B117 plants is dark green with upright leaves and plant height similar to B73 and Mo17. B117 has small, tapering ears with 12 kernel rows on pink cobs. Kernels are flinty with a small, soft, dent cap. Grain quality is excellent. B117 flowers 1.5 d later than Mo17 and 4 d later than B97. B117 is classified in the AES700-800 maturity group.

B118 was developed from the same F_2 populations as B117 and the same methods of selection and testing for B117 were used in the development B118. Pedigree of B118 is (B97 × B99)-024-1-1-2-1-2-1-1-B. Performance of B118 in testcross and single-cross trials was similar to B117 in most instances but B118 had greater yields than B117 in some trials. The phenotype of B118 is similar to B117 except B118 has lower ear placement and flowers 2.5 d earlier than B117. Ear and kernel types of B118 are similar to B117. B118 is classified in the AES700-800 maturity group.

B119 was developed by pedigree selection from BS13(S)C7, a strain of Iowa Stiff Stalk Synthetic (BSSS) that has undergone 14 cycles of selection primarily for grain yield (Lamkey, 1992). Pedigree of B119 is BS13(S)C7-008-1-1-1-1-1-1-B, which was one of the selected lines intermated to form BS13(S)C8. The BS13(S)C7-008 selection was included in the breeding and pest nurseries for further inbreeding and selection for plant type, root and stalk strength, seed set with hand pollinations, and for resistance to first and second generation European corn borer, gray leaf spot, northern corn leaf blight, and common corn rust. At the S_2 generation, BS13(S)C7-008-1 was included in the topcross nursery, with a Mo17-related line as the tester. On the basis of 4-yr testcross trials, the line was advanced by selfing and crossed to non-BSSS lines. Single-cross trials were conducted in Iowa in 2001 and 2002, and B119 was also included in North Central Region (NCR-167) trials conducted in Nebraska, Iowa (three locations), Illinois, Ohio, Missouri, Pennsylvania, Delaware, and Texas (NCR-167, Annual Report, 2002). B119 exhibited consistently good yields that were either comparable to or exceeded the check hybrids. Stand levels, plant and ear heights, and flowering date were similar to check hybrids, but B119 averaged 1% greater grain moisture at harvest and had 2.6% greater root lodging and 4.7% greater stalk lodging than the average of the check hybrids.

B119 has plant and ear heights similar to B73 and Mo17, and flowers about 1 d later than B73 and 1.5 d earlier than Mo17. B119 has dark green, upright leaves, large tapering ears with red silks, and tends to be prolific. Ears have 16 kernel rows of large yellow, starchy kernels on pink cobs. B119 is classified in the AES700-800 maturity group. B119, as a line, has a distinctive plant type and produces large ears with excellent seed set either with hand pollinations or open pollination. Late in the growing season, 2nd generation European corn borer infestation is evident with the loss of tassels.

B120 was developed by pedigree selection from BSCB1(R)-C12; pedigree of B120 is BSCB1(R)C12-6826-1-1-1-1-1-1-B. BSCB1(R)C12 has undergone 12 cycles of reciprocal recurrent selection with BSSS(R), a strain of BSSS, as the tester parent (Lamkey, 1992). BSCB1(R)C12-6826 was one of the selections intermated to form BSCB1(R)C13. The selection was included in the breeding and pest nurseries for further selfing and selection for plant type, ear size and seed set, synchrony of silk emergence and pollen shed, maturity, and resistance to first and second generation European corn borer, gray leaf spot, northern corn leaf blight, and common corn rust. At the S_2 generation, the selected progeny was included in the topcross nursery, using a B73-related line as tester. Based on testcross yield performance, B120 was included in further trials in Iowa and in the North Central Region (NCR-167) trials conducted in eight states (NCR-167, Annual Report, 2001). B120 had yield and grain moisture levels similar to check hybrids, stands consistently higher than the check hybrids, and good root (1.5% less than checks) and stalk (1.3% more than checks) strength in single-cross hybrids.

Plant and ear heights of B120 are similar to B73 and Mo17. Flowering date of B120 is similar to B73 and 3 d earlier than Mo17. B120 has 14 to 16 kernel rows on short ears with red silks at flowering and pink cobs. B120 has excellent grain quality: kernels are flinty with very limited indentation on the kernel tips. Excellent seed set is obtained with either hand or open pollinations. Maturity classification is AES700-800 maturity group.

B121 was developed by pedigree selection from BS13(S)C6, a strain of BSSS that has undergone 13 cycles of recurrent selection primarily for grain yield (Lamkey, 1992). BS13(S)C6-

7884 was one of the selections intermated to form BS13(S)C7 and was included in the breeding and pest nurseries for further inbreeding and evaluation. During selfing and selection, emphasis was given to plant and ear type, synchrony of silk emergence and pollen shed, root and stalk strength, and resistance to first and second generation European corn borer resistance, gray leaf spot, northern corn leaf blight, and common corn rust. At the S_3 generation, BS13(S)C6-7884-1-1 was included in the topcross nursery, using a Mo17-related line as tester. B121 exhibited consistently good yield in the topcross and single-cross trials conducted in Iowa and in the North Central Regional (NCR-167) trials conducted in eight states (NCR-167 Annual Report 2002). Averaged across all trials, B121 had grain yield and grain moisture at harvest equal to the check hybrids, but B121 had greater incidences of root lodging (8.5% greater) and stalk lodging (3.0% greater) than the average of the check hybrids. Poor root strength was the main deficiency of B121 in crosses and poor root strength was evident in most crosses with Mo17-related lines.

B121 has a dark green plant color and lower ear placement than B73 or Mo17, but plant height of B121 is similar to B73 and Mo17. B121 has intermediate resistance to 1st generation European corn borer but is susceptible to 2nd generation European corn borer. B121 has soft dent kernels on average size ears. B121 flowers 1 d later than B73, 1 d earlier than Mo17, and the same date as B119. B121 is classified in the AES700-800 maturity group.

Seed of B117, B118, B119, B120, and B121 is maintained by the Iowa Agriculture and Home Economics Experiment Station, and is distributed on request by the Committee for Agriculture Development, 133 Curtiss Hall, Iowa State University, Ames, IA 50011-1050.

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REGISTRATIONS OF GENETIC STOCKS

Registration of Three Blue-Seeded Wheat Genetic Stocks Exhibiting Xenia

'Sebesta Blue-1' (Reg. no. GS-151, PI 634538), an awned soft winter wheat, 'Sebesta Blue-2' (Reg. no. GS-152, PI 634539), an awnless soft winter wheat, and 'Sebesta Blue-3' (Reg. no. GS-153, PI 634540), an awned hard spring wheat, are blue-seeded genetic stocks of *Triticum aestivum* L. which carry translocated segments of *Thinopyrum* Á. Löve chromosomes. All three lines are homozygous for the blue aleurone trait. In crosses with white- and red-seeded wheats, the blue aleurone trait exhibits a strong xenia effect, which is expressed in varying degrees from dark to light blue, depending on allelic dosage in the 3*n* endosperm. The Sebesta Blue (SB) genetic stocks were developed specifically for their use as genetic markers in the search for apomictic wheats. The proposed procedure for identifying apomictic wheats is outlined in Morrison et al. (2004). The name Sebesta Blue was selected to honor Dr. Emil Sebesta, the USDA-ARS wheat cytogeneticist at Oklahoma State University from 1958 to 1988, who produced the translocation lines that were used to develop these genetic stocks.

The pedigree of SB-1 and SB-2 is 'Gene' (PI 560129)/3/78×Ci12/CS-Tsts3D//Gene and SB-3 is 78×Ci6/2*Sonlika (CItr 15392). The lines 78×Ci12 and 78×Ci6 are *Th. ponticum* (Podp.) Barkworth & D.R. Dewey translocation lines developed by using irradiated pollen from blue-seeded plants from the cross 'Blue Baart'/'Norco' (Norco: CI*tr* 14482) to pollinate emasculated spikes of the white-seeded, spring wheat 'Pavon 76' (PI 520003). Blue Baart is a disomic substitution line with the *Th. ponticum* translocation (Suneson, 1962). The line CS-Tsts3D is a white-seeded 'Chinese Spring' (CI*tr* 14109) line carrying a 3D substitution from 'Timstein' (CI*tr* 12347). The three SB germplasm lines were selected for blue aleurone and white pericarp seed traits over 20 generations of field testing in Oregon.

According to a preliminary sequential C-banding/FISH (fluorescence in-situ hybridization) analysis (Morrison et al., 2004), SB-3 ($2n = 42$) has a 4BS.4BL.4EL translocation. The *Thinopyrum* segment is large, occupying about two-thirds of the long arm of the chromosome. Karyotypes for the winter SB-1 and SB-2 lines ($2n = 44$) are problematic because 0f numerous and as yet unidentified chromosomal rearrangements that have presumably been caused by irradiation. Two *Thinopyrum* translocations are present in SB-1 and SB-2. One of these appears identical to the 4EL segment identified in SB-3. Another small *Th. ponticum* segment is present on a miniature wheat chromosome that may be a part of 2D. It is likely that this extra chromosome pair has no relationship to the *Thinopyrum* 4EL chromosomal segment carrying the blue aleurone gene.

Despite their altered karyotypes, SB-1 and SB-2 act as stable blue-seeded marker lines. In successive generation testing, the blue aleurone trait does not segregate. In SB crosses to red- and white-seeded wheats, blue versus non-blue seed segregated 3 blue: 1 non-blue. In the case of the two winter lines, SB-1 and SB-2, there is some question as to their promise for open-pollination research. They both show a relatively low level of anther exsertion due to limited filament elongation and tendency of their florets to remain closed during anthesis. This cleistogamous trait has been observed under field and greenhouse conditions at Corvallis, OR, and should be evaluated in other environments as a trait that may limit pollen release into the air. In contrast, SB-3 anthers fully exsert in the Corvallis, OR, environment, thus allowing ample pollen release.

For blue-seeded lines with a weak xenia expression, detection of the blue-aleurone marker can be problematic, especially at the one-dose level (Knott, 1958). In the case of the SB genetic stocks, the blue marker trait is strongly expressed and is clearly visible in one allelic dose. For wide interspecific crosses, particularly with dark, red-seeded species, presence of the blue marker is more easily determined in plump rather than thin seeds.

Voucher specimens of the SB lines are deposited in the OSU and Smithsonian Institute (US) Herbaria. Appropriate recognition of the source should be noted if these genetic stocks contribute to the development of new cultivars, research lines, genetic stocks, and germplasm. Recognition of the source also should be noted for any genetic marker research using the SB lines, or any of their preregistered forms distributed before 2003. Seed increases from preregistered forms are limited to distribution for research purposes only and require appropriate recognition as described above.

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Registration of an Apetalous Male-Sterile Genetic Stock (T368) of Soybean

Genetic Type T368 is an apetalous, male-sterile line of soybean [*Glycine max* (L.) Merr.], Reg. no. GS-37, PI 633541, found by the Soybean Research Foundation as a single plant in the F_{12} generation in a cross of 'SRF 200' × ('SRF 300' × 'Tracy') (Hartwig, 1974). SRF 200 is a selection from 'Amsoy 71' × ['Amsoy' (5) × 'SRF 350'] (Probst et al., 1972; Weber, 1966). SRF 350 is a selection from 'Wayne' (3) × D61-5141 (Bernard, 1966). D61-5141 is a narrow leaf selection from 'Dorman' (5) × PI 181537 (Weiss and Stevenson, 1955). SRF 300 is a selection from Wayne (6) × D61-5141. Genetic studies indicated that a single recessive nuclear gene was responsible for this apetalous, highly male-sterile trait in soybean (Skorupska et al., 1993). The morphological features were the lack of standard petal, lateral wings, keel petals, and the appearance of an elongated sepaloid calyx. Gynoecia were characterized by enlarged unfused ovaries and exposed ovules. The mutant line was added to the Soybean Genetic Type Collection in 2003 and is maintained as the heterozygote (T368H). The mutant line has purple flowers, gray pubescence, erect and normal pubescence, brown pod, yellow seed coat, buff hila, and is maturity group I.

Different types of malformations were observed in androecium development in mutant plants. Mutant flowers had only two to four stamens, which were unable to form a normal staminal column. A full complement of stamens was observed in only about 1% of the mutant flowers. Male sterility was attributed to tapetal malfunction. The plants, however, produced a few selfed pods (Skorupska et al., 1993). Also, a few plants may produce outcrossed pods.

In segregating progenies, the apetalous trait and the male-sterile trait were inherited together. We think that this is a pleiotropic effect, instead of tight linkage of the two traits. Similar pleiotropic effects were reported in an apetalous mutant in oilseed rape *(Brassica napus* L.) by Jiang and Becker (2003).

The plant hormones indole-3-acetic acid (IAA) and abscisic acid (ABA) were quantified and compared in the normal (wild type) and apetally mutant (Skorupska et al., 1994). The mutant had lower endogenous amounts of IAA and ABA than the wild type, and the differences were more pronounced in plants grown in the glasshouse than in plants grown in the field.

Apetalous mutants have been studied extensively in oilseed rape (Jiang and Becker, 2003). Apetalous genotypes may be more efficient in postanthesis photosynthesis and reallocation of assimilates to the seed (Lu and Fu, 1990; Fray et al., 1996; Jiang and Becker, 2001). These groups reported that in certain genetic backgrounds, apetalous mutants showed larger leaf area index and heavier dry matter biomass in comparison to sibling lines with normal flowers. In the apetalous mutant reported by Jiang and Becker (2001), reduced pollen production was recorded, but there was normal seed set after self-pollination.

The soybean apetalous mutant might have utility as a female parent in hybrid seed production for plant breeding studies. The manual cross-pollination success rate with apetalous plants as female parent are comparable to cross-pollinations made with fertile siblings plants as female parent. Under field conditions, we expect insect-mediated cross-pollination to be higher under more humid conditions than under low humid conditions. The unprotected stigma of the apetalous mutant is more vulnerable to desiccation under low humidity. Petal color, size, and volatiles (floral scents) are important cues to attract pollinating insects (Palmer et al., 2001). We have not verified if the apetalous soybean mutant is less attractive to pollinating insects than petalous sibling plants.

Perhaps of greatest importance is that certain apetalous mutants in oilseed rape may avoid some diseases, especially stem rot [caused by *Sclerotinia sclerotiorum* (Lib.) de Bary] and downy mildew (caused by *Peronospora parasitica* Pers.:Fr.) (Jiang and Becker, 2001). Lu and Fu (1990) reported 28 and 12.4% field incidence of S. *sclerotiorum* for two cultivars while the field incidence for the apetalous breeding line was only 1.8%.

Sclerotinia stem rot (syn. white mold) in soybean is distributed in the USA, Canada, Argentina, Brazil, and China (Kim et al., 1999). Wrather et al. (1997) ranked white mold as the second most important soybean disease in the USA during 1994. Soybean plants are infected primarily by ascospores that land on flowers (Grau, 1988). The ascospores germinate, use the flower petals as a nutrient source, and the fungus eventually girdles the stem resulting in plant death. The apetalous male-sterile soybean mutant may avoid this disease because it lacks petals.

A sample of 50 seeds will be available for at least 5 yr for research purposes from the corresponding author. Seed of T368H are available from the Curator, Soybean Germplasm Collection, USDA, ARS, Dep. of Crop Sciences, 1102 S. Goodwin Ave., University of Illinois, Urbana IL 61801.

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